Activity Hazard Analysis
Former Mojave Gunnery Range "C" RI Work Plan

Activity UXO Escort **Analyzed by/Date**_____ **Reviewed by/Date**_____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Provide UXO escort activities on site Lifting	UXO Weather-related hazards: Wind, rain, sun Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants: Cactus Lifting hazards	Apply CESPL safety concepts and basic considerations. Proper footing. Know heat stress warning signs and proper action. Do not move ordnance without prior CESPL on-site safety representative approval. Have first-aid kits and fire extinguishers. Use flagging system to mark UXO. Use eye protection. Use proper lifting techniques.

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Geophysical equipment Level D PPE with leather boots and leather gloves	Daily check of geophysical equipment using buried source	EOD School graduate HAZWOPER initial 40-hour training Site-specific training Review and comply with SSHP

Activity Hazard Analysis
Former Mojave Gunnery Range "C" RI Work Plan

Activity Geophysical Investigation **Analyzed by/Date**_____ **Reviewed by/Date**_____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Conduct geophysical sweep of UXO survey lane	UXO Weather-related hazards: Wind, rain, sun Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants: Cactus Lifting hazards	Apply CESPL safety concepts and basic considerations. Proper footing. Know heat stress warning signs and proper action. Do not move ordnance without prior CESPL on-site safety representative approval. Have first-aid kits and fire extinguishers. Use flagging system to mark UXO. Use eye protection.

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Hand-Towed EM/magnetometer Level D PPE with leather boots	Daily check of geophysical equipment using buried source	EOD School graduate HAZWOPER initial 40-hour training Site-specific training Review and comply with SSHP

Activity Hazard Analysis
Former Mojave Gunnery Range "C" RI Work Plan

Activity Heavy Equipment Operation **Analyzed by/Date**_____ **Reviewed by/Date**_____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Operating heavy equipment, excavating pits To bury simulators in geophysical test plots	Vehicle accident Wildlife, insects, and hazardous plants Slips, trips, and falls Scrapes and cuts Heat stress Sunburn/windburn	EMM will be operated by trained, experienced personnel. Look before backing; be aware of personnel in the area of EMM. Negotiate slopes straight up or down; do not travel across a slope. All controls in traveling position when moving EMM between sites. When excavating, if personnel are in range of bucket, put bucket on the ground and remove hands from controls; place blades and buckets on ground when not operating. Wear Level D PPE with hard hat, hearing protection, and steel-toed footwear, when working in the vicinity of operating EMM. Be aware of terrain; avoid obstacles when possible; take care when mounting/ dismounting EMM. Dress for weather. Use Buddy System monitoring. Use sunscreen, insect repellent/barrier cream as necessary.

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Earth Moving Machinery (EMM) Communication equipment, fire extinguisher, first aid kit Level D PPE with hard hat, leather boots, leather gloves, and safety glasses	Daily PMCS of equipment. Radio check.	OSHA-qualified; UXO personnel are EOD-trained. Experienced operators. Daily tailgate briefing. Emergency procedures and safe working practices IAW the SSHP, EM 385-1-1, Section 16. Symptoms and treatment for biological hazards IAW the SSHP. Daily checks of all communication and emergency equipment.

Activity Hazard Analysis
Former Mojave Gunnery Range "C" RI Work Plan

Activity Ground Reconnaissance Operations **Analyzed by/Date** _____ **Reviewed by/Date**_____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Ground Reconnaissance Lifting	UXO Heat stress Weather-related hazards: Wind, rain, sun Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Sunburn/windburn Dangerous plants: Cactus Insects Lifting hazards	Apply CESPL safety concepts and basic considerations. Proper footing. Know heat stress warning signs and proper action. Do not move ordnance without prior CESPL on-site safety representative approval. Have first-aid kits and fire extinguishers. Use eye protection. Use proper lifting techniques.

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Hand-held magnetometer GPS, radio, first-aid kit Fire extinguisher Level D PPE with leather boots, leather gloves, and safety glasses	Daily check of geophysical equipment using buried source Radio check Inspect first-aid kit and fire extinguisher	EOD School graduate HAZWOPER initial 40-hour training Site-specific training Review and comply with SSHP Current state driver's license

APPENDIX E
MSD Calculation Sheets

FRAGMENTATION DATA REVIEW FORM

Database Revision Date 7/31/07

Category:	HE Rounds	DODIC:	H469
Munition:	2.75" M229 Rocket	Date Record Created:	7/30/2004
		Last Date Record Updated:	6/20/2005
Primary Database Category:	rocket	Individual Last Updated Record:	Crull
Secondary Database Category:	2.75 in	Date Record Retired:	
Munition Case Classification:	Robust		

Munition Information and Fragmentation Characteristics

Explosive Type:	Comp B
Explosive Weight (lb):	4.80000
Diameter (in):	2.7500
Max Fragment Weight (lb):	0.050092
Critical Fragment Velocity (fps):	5569

Theoretical Calculated Fragment Range

Range to No More Than 1 Hazardous Fragment/600 Square FeetA (ft):	302
Vertical Range of Maximum Weight Fragment (ft):	1088
Horizontal Range of Maximum Weight Fragment (ft):	1374

Overpressure Distances

Inhabited Building Distance (12 psi), K40 Distance:	76
Inhabited Building Distance (09 psi), K50 Distance:	95
Intentional MSD (0065 psi), K328 Distance:	625

Minimum Thickness to Prevent Perforation

4000 psi Concrete (Prevent Spall):	2.91
Mild Steel:	0.54
Hard Steel:	0.45
Aluminum:	1.18
LEXAN:	3.87
Plexi-glass:	2.44
Bullet Resist Glass:	1.90

Required Sandbag Thickness

Max Fragment Weight (lb)SB:	0.050092
Critical Fragment Velocity (fps)SB:	5569
Kinetic Energy 106 (lb-ft2/s2)SB:	0.7768
Required Wall Roof Sandbag Thickness (in)SB:	24
Expected Maximum Sandbag Throw Distance (ft)SB:	135
Minimum Separation Distance (ft)SB:	200

Water Containment System and Minimum Separation Distance:

Max Fragment Weight (lb)W:	0.050092
Critical Fragment Velocity (fps)W:	5569
Kinetic Energy 106 (lb-ft2/s2)W:	0.7768
Water Containment System:	1100 gallon tank
Minimum Separation Distance (ft)W:	200

Print This Form

Close Form

FRAGMENTATION DATA REVIEW FORM

Database Revision Date 7/31/07

Category:	HE Rounds	DODIC:	A890
Munition:	20 mm M56A4	Date Record Created:	7/30/2004
		Last Date Record Updated:	11/9/2006
Primary Database Category:	projectile	Individual Last Updated Record:	Crull
Secondary Database Category:	20 mm	Date Record Retired:	
Munition Case Classification:	Robust		

Munition Information and Fragmentation Characteristics

Explosive Type:	H-761 (RDX)
Explosive Weight (lb):	0.02640
Diameter (in):	0.7874
Max Fragment Weight (lb):	0.002681
Critical Fragment Velocity (fps):	4941

Theoretical Calculated Fragment Range

Range to No More Than 1 Hazardous Fragment/600 Square FeetA (ft):	200
Vertical Range of Maximum Weight Fragment (ft):	447
Horizontal Range of Maximum Weight Fragment (ft):	558

Overpressure Distances

Inhabited Building Distance (12 psi), K40 Distance:	13
Inhabited Building Distance (09 psi), K50 Distance:	16
Intentional MSD (0065 psi), K328 Distance:	107

Minimum Thickness to Prevent Perforation

4000 psi Concrete (Prevent Spall):	1.09
Mild Steel:	0.21
Hard Steel:	0.17
Aluminum:	0.47
LEXAN:	2.16
Plexi-glass:	1.13
Bullet Resist Glass:	0.83

Required Sandbag Thickness

Max Fragment Weight (lb)SB:	0.002681
Critical Fragment Velocity (fps)SB:	4941
Kinetic Energy 106 (lb-ft2/s2)SB:	0.0327
Required Wall Roof Sandbag Thickness (in)SB:	12
Expected Maximum Sandbag Throw Distance (ft)SB:	25
Minimum Separation Distance (ft)SB:	200

Water Containment System and Minimum Separation Distance:

Max Fragment Weight (lb)W:	0.002681
Critical Fragment Velocity (fps)W:	4941
Kinetic Energy 106 (lb-ft2/s2)W:	0.0327
Water Containment System:	5 gal carboys/ inflatable pool
Minimum Separation Distance (ft)W:	200/200

Print This Form

Close Form

FRAGMENTATION DATA REVIEW FORM

Database Revision Date 7/31/07

Category:	HE Bomb	DODIC:	
Munition:	1000 lb GP Bomb AN-M65A1	Date Record Created:	7/27/2007
		Last Date Record Updated:	
Primary Database Category:	bomb	Individual Last Updated Record:	MC
Secondary Database Category:	1000 lb	Date Record Retired:	
Munition Case Classification:	Non-Robust		

Munition Information and Fragmentation Characteristics

Explosive Type:	Comp B
Explosive Weight (lb):	595.00000
Diameter (in):	18.8000
Max Fragment Weight (lb):	0.701966
Critical Fragment Velocity (fps):	9385

Theoretical Calculated Fragment Range

HFD [Range to No More Than 1 Hazardous Fragment per 600 Square Feet] (ft):	810
MFR-V [Vertical Range of Max Weight Fragment] (ft):	2673
MFR-H [Horizontal Range of Maximum Weight Fragment] (ft):	3355

Overpressure Distances

Inhabited Building Distance (12 psi), K40 Distance:	380
Inhabited Building Distance (09 psi), K50 Distance:	475
Intentional MSD (0065 psi), K328 Distance:	3115

Minimum Thickness to Prevent Perforation

4000 psi Concrete (Prevent Spall):	17.36
Mild Steel:	2.59
Hard Steel:	2.12
Aluminum:	5.27
LEXAN:	9.46
Plexi-glass:	7.98
Bullet Resist Glass:	6.90

Required Sandbag Thickness

Max Fragment Weight (lb)SB:	0.701966
Critical Fragment Velocity (fps)SB:	9385
Kinetic Energy 106 (lb-ft2/s2)SB:	30.9100
Required Wall Roof Sandbag Thickness (in)SB:	N/A
Expected Maximum Sandbag Throw Distance (ft)SB:	N/A
Minimum Separation Distance (ft)SB:	N/A

Water Containment System and Minimum Separation Distance:

Max Fragment Weight (lb)W:	0.701966
Critical Fragment Velocity (fps)W:	9385
Kinetic Energy 106 (lb-ft2/s2)W:	30.9100
Water Containment System:	N/A
Minimum Separation Distance (ft)W:	N/A

◄ ► Print This Form Close Form

APPENDIX F
Contractor Forms

MARRS

Geophysical Mapping Field Log v3.3

Survey Parameters			
	GPS	Dead Rec	Proc
EM61 Mode:	Auto		
Wheel Inc:	N/A		
Readings:	12		
Surv Line:	1		
Line Incr:	1		
Sequence:	One Way		
Direction:	North		
Start Stn:	0		
Stn Incr:	Positive		
Units:	Feet		

Project:	**Former Mojave Gunnery Range "C"**	Date:	Operator (s):
Equipment:	**EM61 Mk2 Dual Array**	SN: G=(TB) BRJ00-5, R=(TB) BRJ00-10, 5700=0220289152, Allegro=7272	
Survey Mode:	**Machine -towed, RTK-referenced**	Man-Towed Dead-Reckonin	
Setup:	Coil Height (cm) **39**	Antenna Height (cm) **137**	Coil Height = bottom of bottom coil to ground Antenna Height = bottom of antenna to ground
Geo File Name:	PPMMDDFT Forma	GPS QC File Name:	PPMMDDFT Forma
Log Type:	QC Field Data Collection		(circle appropriate)
Type of Collection:			Production Survey, QC Resurvey, Validation, Test, Othe
Standard Response:	Ch1 Ch2 Ch3 ChT Ch1 Ch2 Ch3 ChT		
Calibration Point Coordinates	Latitude/Northing	Longitude/Easting	

Time	Line #	Operation	Procedures	Acceptance Criteria	Results/Notes
	N/A	Power On	Turn on units, note time, warm up for ~ 30 minutes	Stable Readings	
	N/A	Conditions	Record Weather Conditions	N/A	Temp / Conditions
	N/A	Survey Setup	Verify settings with SurveyParameters above	Go/ No Go	
	N/A	Time Sync	Sync EM-61 Clock with GPS Clock	+/- 0.1 seconds	
	N/A	Main Battery Voltage	Record voltage	Should be greater than 12 V	Voltage Unit 1 / Voltage Unit 2
	N/A	Positioning Check	Verify GPS coordinates at reference point	+/- 0.3 ft or +/-0.004 sec	Latitude/Northing / Longitude/Easting / dH
	N/A	Personnel Test	Check personnel for change, watches, cel phones, etc.	+/- 2 mV	
		Cable Shake Test	After null, shake cables while watching #s	No data spikes	
		Static Test 1	Log over reference point (no reference item) for 3 min	+/- 2.5 mV	Ch1 Ch2 Ch3 ChT Ch1 Ch2 Ch3 ChT
		Reference Test 1	Log over reference item for 1 minute	+/- 10% of reference standard	Ch1 Ch2 Ch3 ChT Ch1 Ch2 Ch3 ChT
		Static Test 2	Log over reference point (no reference item) for 1 min	+/- 2.5 mV	Ch1 Ch2 Ch3 ChT Ch1 Ch2 Ch3 ChT
	LN #	Latency Check	With Reference Item Speed OP up, OP dn, Fast up, Slow dn	Line numbers each line →	OP UP / OP DN / Slow UP / Fast DN
	LN #	Mini Validation	Without Reference Item change line #'s on each pass	Line numbers each line →	UP Left / DN Left / UP Right / DN Right / UP Mid
	List Below in Comments	**Collect Field Data**	**Log field data at Op speed**	**N/A, Field Collection Only, For additional survey lines, use comments**	
		Static Test 3	Log over reference point (no reference item) for 3 min	+/- 2.5 mV	Ch1 Ch2 Ch3 ChT Ch1 Ch2 Ch3 ChT
		Reference Test 2	Log over reference item for 1 minute	+/- 10% of reference standard	Ch1 Ch2 Ch3 ChT Ch1 Ch2 Ch3 ChT
		Static Test 4	Log over reference point (no reference item) for 1 min	+/- 2.5 mV	Ch1 Ch2 Ch3 ChT Ch1 Ch2 Ch3 ChT
	N/A	Main Battery Voltage	Record voltage	Should be greater than 11.00 V	Voltage Unit 1 / Voltage Unit 2
	N/A	Time Sync	Check Time Sync (EM-61 Clock with GPS Clock)	+/- 0.1 seconds	Record Time Offset (tenths of seconds)
	N/A	Conditions	Record Weather Conditions	N/A	Temp / Conditions

Comments:

MARRS

Geophysical Mapping Field Log v3.3

Survey Parameters			
	GPS	Dead Rec	Proc
EM61 Mode:	Auto		
Wheel Inc:	N/A		
Readings:	10		
Surv Line:	1		
Line Incr:	1		
Sequence:	One Way		
Direction:	North		
Start Stn:	0		
Stn Incr:	Positive		
Units:	Feet		

Project:	**Former Mojave Gunnery Range "C"**	Date:	Operator (s):
Equipment:	**EM61 Mk2 Single Coil** SN: Top= , Bottom= , EM61= , Allegro= , 5700=		
Survey Mode:	**Man - portable RTK-referenced** (Man-Towed Dead-Reckoning)		
Setup:	Coil Height (cm)	Antenna Height (cm)	(Coil Height = bottom of bottom coil to ground; Antenna Height = bottom of antenna to ground)
Geo File Name:	(PPMMDDFT Format)	GPS QC File Name:	(PPMMDDFT Format)
Log Type:	QC Field Data Collection		(circle appropriate)
Type of Collection:	(Production Survey, QC Resurvey, Validation, Test, Other)		
Standard Response:	Ch1 Ch2 Ch3 ChT Ch1 Ch2 Ch3 ChT		
Calibration Point Coordinates	Latitude/Northing	Longitude/Easting	

Time	Line #	Operation	Procedures	Acceptance Criteria	Results/Notes
	N/A	Power On	Turn on units, note time, warm up for ~ 30 minutes	Stable Readings	
	N/A	Conditions	Record Weather Conditions	N/A	Temp; Conditions
	N/A	Survey Setup	Verify settings with SurveyParameters above	Go/ No Go	
	N/A	Time Sync	Sync EM-61 Clock with GPS Clock	+/- 0.1 seconds	
	N/A	Main Battery Voltage	Record voltage	Should be greater than 12 V	Voltage Unit 1; Voltage Unit 2
	N/A	Positioning Check	Verify GPS coordinates at reference point	+/- 0.3 ft or +/-0.004 sec	Latitude/Northing; Longitude/Easting; dH
	N/A	Personnel Test	Check personnel for change, watches, cel phones, etc.	+/- 2 mV	
		Cable Shake Test	After null, shake cables while watching #s	No data spikes	
		Static Test 1	Log over reference point (no reference item) for 3 min	+/- 2.5 mV	Ch1 Ch2 Ch3 ChT Ch1 Ch2 Ch3 ChT
		Reference Test 1	Log over reference item for 1 minute	+/- 10% of reference standard	Ch1 Ch2 Ch3 ChT Ch1 Ch2 Ch3 ChT
		Static Test 2	Log over reference point (no reference item) for 1 min	+/- 2.5 mV	Ch1 Ch2 Ch3 ChT Ch1 Ch2 Ch3 ChT
	LN #	Latency Check	With Reference Item Speed OP up, OP dn, Fast up, Slow dn	Line numbers each line →	OP UP; OP DN; Slow UP; Fast DN
	LN #	Mini Validation	Without Reference Item change line #'s on each pass	Line numbers each line →	UP Left; DN Left; UP Right; DN Right; UP Mid
	List Below in Comments	**Collect Field Data**	**Log field data at Op speed**	**N/A, Field Collection Only, For additional survey lines, use comments**	
		Static Test 3	Log over reference point (no reference item) for 3 min	+/- 2.5 mV	Ch1 Ch2 Ch3 ChT Ch1 Ch2 Ch3 ChT
		Reference Test 2	Log over reference item for 1 minute	+/- 10% of reference standard	Ch1 Ch2 Ch3 ChT Ch1 Ch2 Ch3 ChT
		Static Test 4	Log over reference point (no reference item) for 1 min	+/- 2.5 mV	Ch1 Ch2 Ch3 ChT Ch1 Ch2 Ch3 ChT
	N/A	Main Battery Voltage	Record voltage	Should be greater than 11.00 V	Voltage Unit 1; Voltage Unit 2
	N/A	Time Sync	Check Time Sync (EM-61 Clock with GPS Clock)	+/- 0.1 seconds	Record Time Offset (tenths of seconds)
	N/A	Conditions	Record Weather Conditions	N/A	Temp; Conditions

Comments:

MOJAVE GUNNERY RANGE "C"
Remedial Investigation
California City, CA
USACE Contract Number: W912PL-06-D-0008
Daily Geophysical Data Processing Checklist
Date: _____

Process	Process Description	Parameters / Methods / Comments	Compliant	Non-Compliant
		Make / Model **/ SN / Ver**		
Project Information	Geophysical Equipment			
	Geophysical Base Station			
	Positioning Equipment			
	Positioning Base Station			
	Acquisition Software			
	Processing Software			
		Comments		
Field Log Review	Team Members Identified			
	Survey Area Defined			
	Equipment Setup Parameters			
	File Name(s)			
	Data Acquisition Method			
	Data Quality Standards			
		Filename / Date		
Data Downloads	Raw Geophysical Data			
	Geophysical Base Station Data			
	GPS Field Data			
	GPS QC Data			

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Phone (562) 407-1094

Process	Item Description	Parameters / Methods / Comments	Compliant	Non-Compliant
		Filename / Date		
Data Conversions	Apply Sensor Offset(s) and Positioning			
	Convert Raw Data to X,Y,Z,… ASCII Format (add header)			
	Convert Geophysical Base to ASCII Geosoft Base Format			
	Convert GPS to X,Y,Z,T,… ASCII Format			
		Comments	Pass	Fail
Concurrent QC	Positioning Check			
	Cable Shake			
	Static Noise Tests (open and close)			
	Standard Response (open and close)			
	Process	Parameters		
Data Corrections	Diurnal (MAG only)			
	Heading Correction (MAG only)			
	Instrument Drift			
	Latency			
	Despiking			
		Comments	Pass	Fail
Concurrent QC	Dynamic Response (in-situ calibration) (mini-validation)			
	SNR Dynamic Response Data			
	SNR Field Data			
	Data Coverage (spacing, speed, drop-outs, gaps, and holidays)			
	Latency Errors			
	Noise Threshold			

Item No.	QMS Item Description	Reference		Compliant	Non-Compliant
	Process	Parameters			
Data Processing	Pre-grid 1D Filtering (algorithm and parameters)				
	Gridding (Algorithm, Grid size, Blanking distance, others)				
	Post-grid 2D Filtering (algorithm and parameters)				
	Process	Parameters			
Data Interpretation	Target Selection Algorithm				
	Grid Analized				
	Smoothing Factor				
	Peak Detection Mode				
	Grid Cutoff Value				
	Verify Target Numbers and Naming Scheme				
	Process	Parameters			
Target Analysis	Calculate Target Size				
	Calculate Target Depth				
	Calculate Target Weight (magnetic)				
	Calculate Time Constant				
	Calculate Decay Curves				
	Compare Target characteristics with Project Target Data Base				
	Prioritize Targets				
	Create Dig Sheets / Target DB				
	Process	Parameters			
Results Presentation	Static QC Plots				
	Dynamic QC Plots				
	Grid Maps				
	Target List Entered into DB				
	Process	Parameters			
Reacquisition	Targets uploaded to Electronic Dig sheet				
	Dig sheets reviewed for completeness				
	Intrusive results compared with geophysical results				
	False positive data (no contact) dig results resolved				
	Dig results uploaded to DB				
	Final dig results map Posted in GIS				

Item No.	Comments

Quality Control Specialist

Date

SUXOS/SM

Date

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Phone (562) 407-1094

MARRS

MOJAVE GUNNERY RANGE "C"
Remedial Investigation
California City, CA
USACE Contract Number: W912PL-06-D-0008
Daily Geo Quality Control Inspection
Date: _____

Item No.	QMS Item Description
11.000	**Geophysical Detection and Mapping**
11.100	***Equipment Quality Control***
11.102	Startup procedures conducted IAW Work Plan
11.103	Cable and connector integrity checked as part of daily setup; electrical leads secured.
11.104	Physical ("shake") tests accomplished to ensure there are no extraneous sources of instrument noise impacting the collected data.
11.105	battery voltage recorded
11.106	sufficient instrument warm-up periods observed
11.107	instrumentation properly nulled
11.108	Static noise response repeatable and within acceptance parameters
11.109	Dynamic noise response repeatable and within acceptance parameters
11.110	Latency response repeatable and within acceptance parameters
11.111	Instrument precision response repeatable and within acceptance parameters
11.112	Standardization check results at least 80% of the established standard response
11.113	GPS position checks within 0.3 meter
11.114	GPS base station set up and initialization IAW Work Plan
11.115	Tests performed to ensure radio linkage and reception by the GPS units
11.116	Equipment Quality Control documented IAW Work Plan
11.200	***Field Operations***
11.201	Logical and consistency file naming convention maintained.
11.202	Naming conventions and data structure properly recorded in log books.
11.203	Changes to instrument configuration, including operator, documented in field logs.
11.204	Field teams utilizing techniques to maintain proper line spacing IAW Work Plan.
11.205	Survey system speed appropriate for required data density and signal-to-noise ratio.
11.206	Field teams practicing appropriate techniques to minimize EM noise.
11.207	Synchronization between geophysical sensors and positioning system monitored and documented in daily log.
11.208	Drift and functionality of the sensors were monitored during data collection.
11.209	Data was collected following a continuous progression along the survey lanes.
11.210	Causes of deviation from planned transect and the actual mode of progression are fully described in the field logbook notes.

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11.211	Data collection activities were recorded by the field crew on daily log sheets, including sketch maps and observations of site environment condition.
11.300	***Data Processing***
11.301	Logical and consistent file naming convention observed.
11.302	Naming convention and data structure recorded in processing log.
11.303	Instrument sampling rate and survey speeds appropriate for reliable detection of subsurface MEC.
11.304	GPS sampling rates, survey speed, and instrument sampling rate allow accurate positioning of data.
11.305	Sensor data evaluated for time gaps and sensor failure
11.306	Data dropouts are less than 2% of the potential data acquired.
11.307	Data volume for each receiver array is comparable (±1 percent).
11.308	Static data were evaluated and digital images of profiles showing system response versus time were generated.
11.310	Data filters were applied and documented as specified in the Work Plan.
11.311	Data gridding algorithms were applied and documented as specified in the Work Plan
11.312	Data processing search radii, number of data points and patterns (e.g., quadrants, ellipticity, etc.) were applied and documented as specified in the Work Plan.
11.313	Profile data (response vs. time) were examined for unusual and non-geophysical responses
11.314	Review of data statistics and measurement coordinates (location accuracy)
11.316	Data processing steps accurately documented (processing log).
11.400	***Data Validation***
11.401	All data specified by the Work Plan were captured and processed.
11.402	Station spacing along each lane or transect was IAW Work Plan
11.403	The spatial data density (measurements per unit distance) is representative of the mapping effort described in the daily log.
11.405	GPS data has sufficiently low PDOP or horizontal resolution error to ensure locations are accurate to less than 0.5 m
11.406	Field data were accurately located and show good/acceptable correspondence to known references and/or features at the project site.
11.407	Data statistics were evaluated with reference to the number of targets in the reviewed data set.
11.409	Responses typical of instrument or geologic noise but not metallic sources were not included in target list.
11.410	Target selection limited to discrete, closed contour anomalies with shape disparate from the geologic background response or clutter trends.
11.411	Data were examined for target locations omitted by the automated routines or to delete obvious non-MEC-related anomalies.
11.412	Data for false positive (No Contact) dig results were extracted from database and evaluated/resolved.
11.413	MEC field anomaly map and digital data image (for a sample population of the anomalies investigated) is representative of intrusive sampling results.

All Daily Checks listed above are logged in the two daily logs referenced below; a daily check of the logs will ensure compliance to the above listed items.	**Compliant**	**Non-Compliant**
Geophysical Mapping Field Log		
Geophysical Data Processing Log		

Item No.	Comments

Quality Control Specialist

Date

SUXOS/SM

Date

MOJAVE GUNNERY RANGE "C"
Remedial Investigation
California City, CA
USACE Contract Number: W912PL-06-D-0008

Daily Field Summary

Date:
Personnel:

Planned Activities:

Completed Activities:

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Phone (562) 407-1094

Comments:

Signature: _____

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MOJAVE GUNNERY RANGE "C"
Remedial Investigation
California City, CA
USACE Contract Number: W912PL-06-D-0008
Quality Management System Audit Schedule

Item No.	QMS Item Description	Schedule
1.000	**Project Documents Required On-Site**	
1.010	Regulatory Documents/Orders	I, M
1.020	Site-Specific Safety and Health Plan and Addenda	I, M
1.030	Explosive Safety Submission	I, M
1.040	Work Plan	I, M
1.050	Technical Project Plan	I, M
2.000	**Pre-Mobilization**	
2.010	Contract and all modifications and change orders up-to-date and approved.	I, M
2.020	Letter authorizing project start-up received and copied to project files.	I
2.030	Contractual definable features of work established and agreed upon between MARRS and the **customer** (what they want, and what and how we will provide it).	I
2.040	Contractual definable features of work established and agreed upon between MARRS and its **subcontractors** (what we want, and what and how they will provide it).	I
2.050	Data Quality Objectives established (project requirements and method(s) of measuring achievement defined) and approved by MARRS and the customer.	I
2.060	Depth of investigation/clearance identified.	I
2.070	Investigative/clearance area defined.	I, S
2.080	MEC of concern identified and clearance criteria defined.	I
2.090	File on all UXO qualified personnel to include: NAVSCOLEOD cert., up to date physical, 40-hr HAZWOPER cert., up to date 8-hr HAZWOPER cert.	I, M
2.100	File on SUXOS, QC, SSO, and all UXOSs, a copy of an 8-hr HAZWOPER supervisor cert.	I

2.110	Personnel approval letter for all UXO personnel on site.	I, M
2.120	Necessary procurements completed.	I
2.130	QA/QC management system established.	I
2.140	Preparatory Phase Readiness Review completed.	I
3.000	**Equipment Maintenance/Functional Checks**	
3.010	Instrument operational checks accomplished daily IAW the Work Plan.	D
3.020	Equipment calibrated and tested prior to use IAW the Work Plan.	D
3.030	GPS systems inspected and serviceable.	D
3.040	Demolition equipment inspected and serviceable.	I, S
3.050	Vehicle communications inspected and serviceable.	D
3.060	Hand and power tools inspected and serviceable.	D
4.000	**Safety**	
4.010	PPE being provided and used properly on site.	D
4.020	Maps posted identifying the proper MSD for each clearance area.	W
4.030	Emergency Route Maps posted and provided to all on-site personnel.	W
4.040	Heavy equipment inspected and serviceable.	D
4.050	Hazard Analysis and Risk Assessment for all project tasks and on-site equipment.	I, M
4.060	Copies of MSDSs for all hazardous substances used and/or stored on site.	I, M
4.070	Equipment operated to prevent impact with MEC.	D
4.080	First Aid and CPR training certificate (required to have a minimum of two qualified personnel on site when field activities are taking place).	I, M
4.090	Tasks requiring MEC escort identified.	S
4.100	Two separate means of on-site communications inspected and serviceable.	D
4.110	Personnel protective equipment (PPE) for all on-site personnel to include visitors.	D
4.120	PPE adequate and serviceable and used.	D
4.130	Approved containers for flammable storage used.	I, W
4.140	Heavy equipment is used IAW the procedures established in the site work plan.	D
4.150	Adequate work space and restroom facilities.	I, M
4.160	Maximum personnel occupancy limits maintained at on-site office facilities.	I, M

4.170	First-aid equipment immediately available to all on-site personnel.	D
4.180	Emergency eye wash immediately available to all on-site personnel.	D
4.190	Emergency Notification List (ENL) in each site vehicle and available to all personnel.	I, M
4.200	Tools adequate and serviceable.	I, D
4.210	Fire exits marked and not blocked.	I, D
4.220	Fire extinguishers posted as required in all on-site vehicles, and in all on-site buildings.	D
4.230	Department of Defense Notice to Airmen (NOTAM) forwarded to the area Federal Aviation Administration	I
5.000	**Site Management**	
5.010	Licenses and permits as required - HR, EOE, H&S, etc. documents prominently posted.	I, M
5.020	All personnel thoroughly trained in the performance of their work and the collection of any data for which they are responsible.	I, M
5.030	Good housekeeping maintained.	D
5.040	Records of activities performed on the project data maintained.	W
5.050	SUXOS on site during all field operations.	D
5.060	All required equipment on-site and operational.	D
5.070	All required facilities on-site functional.	D
5.080	MEC demolition site selected and prepared prior to the start of field operations.	I
5.090	Names and contact procedures for First Aid/CPR-qualified on-site project personnel posted in field office.	I, M
5.100	Required personnel on-site.	I, D
5.110	Database designed and established.	I
5.120	Daily Field logs established for all on-site supervisors and above, and maintained as project property and reviewed and initialed daily by the site manager or designee.	D
5.130	Initial Phase Readiness Review completed and unimplemented items identified.	I
5.140	Final Readiness Review complete and all items resolved.	S
5.150	Digital data backups conducted IAW Work Plan.	S
5.160	Property Management QC Checks: 1. Property and equipment stored in lockable containers or inside office trailers? 2. Property tracking log established and maintained? 3. Property log attached to weekly reports? 4. Property lost, damaged, or destroyed reported to Project Manager?	

6.000	**Transportation of Explosive Materials**	
6.010	Motor vehicle inspection performed.	I, S
6.020	Vehicles transporting explosives display all required placards, lettering, and numbers required.	S, D
6.030	Operators transporting explosives have valid driver's license and current CDL.	S, D
6.040	Transported loads blocked and braced.	
6.050	First-aid kit and 2 10 lb. Fire extinguishers rated for BC fires maintained in the vehicle.	S, D
6.060	No flame-producing articles in explosives transport vehicle or on persons conducting transport, or handling the explosives.	S, D
6.070	Vehicle communications established and maintained.	S, D
6.080	Explosives compatibility constraints observed.	S, D
7.000	**Explosives Management**	
7.010	End user is certifying use in writing.	I
7.020	MEC inventory Inspection conducted weekly.	W
7.030	MEC Magazine Data Cards maintained up-to-date.	I, S
7.040	Proper magazine type used.	I, M
7.050	Explosive Acquisition Plan in place before starting field operations.	I
7.060	Approved MEC/explosive storage facilities used on site.	I, S
7.070	Explosive compatibility maintained.	I, S
7.080	Initial receipt procedures and documentation procedures on site and followed.	I, S
7.090	A list of persons authorized to receive; issue and transport explosives will be maintained on-site.	I, M
7.100	Magazine site meets all BATF, state, and local requirements	I, M
7.110	Magazine NEW is maintained at or below the established weight at all times.	I, S, M
7.120	Receipt procedures accounting for each explosive item received have been established.	I
7.130	Fire-fighting control plan established and posted.	I
7.140	Proper fire division symbol at entrance to storage site.	I, M
7.150	Area around magazine free of rubbish, brush, dry grass, trees, for a minimum of 25 feet.	I, M
7.160	Physical security and key control plan in place.	I, M
7.170	Explosives licenses and permits posted in field office.	I, M
7.180	End user certification of explosives use.	I, M

8.000	**Geographic Information System**	
8.010	Posting of data for each activity to GIS map.	W
8.020	Records of metadata maintained.	W
8.030	Ensuring that the project database is updated at least weekly throughout the duration of the field project.	W
8.040	Utilization of standardized naming conventions.	I, S
9.000	**Site Preparation**	
9.010	Vegetation cleared IAW the site work plan.	I
9.020	Grid stake locations checked with geophysical equipment prior to driving monument stakes.	S
9.030	Grids marked IAW the site work plan.	I
9.040	MEC scrap and metallic debris larger that 1" by 2" removed and placed in the SW corner of the grid or other identified collection area.	S
9.050	Location and surveys were conducted IAW the site work plan.	I
9.060	“Class 1, Third Order” or better used to establish for the network monuments.	I
9.070	Control points identified on a map by name and number.	I
9.080	Requisite site preparation activities are complete prior to initiation of subsequent, sequential activities (e.g., grids are established, marked, cleared, and recorded before geophysical detection and mapping systems are deployed; MSDs are identified and established prior to MEC operations).	I
10.000	**Audit Activities**	
10.010	Audit Plan prepared and approved.	I
10.020	Scheduled audits accomplished.	S
10.030	Audit findings submitted for review.	S
10.040	Corrective actions and/or follow-on activities implemented.	S
10.050	Audit Close-out completed.	S
11.000	**Geophysical Detection and Mapping**	
11.100	***Equipment Quality Control***	
11.101	Instrument nulling location identified IAW the Work Plan.	I
11.102	Startup procedures conducted IAW the Work Plan	
11.103	Cable and connector integrity checked as part of daily setup; electrical leads secured.	D
11.104	Physical ("shake") tests accomplished to ensure there are no extraneous sources of instrument noise impacting the collected data.	D
11.105	battery voltage recorded	D
11.106	sufficient instrument warm-up periods observed	D
11.107	instrumentation properly nulled	D
11.108	Static noise response repeatable and within acceptance parameters	D

11.109	Dynamic noise response repeatable and within acceptance parameters	D
11.110	Latency response repeatable and within acceptance parameters	D
11.111	Instrument precision response repeatable and within acceptance parameters	D
11.112	Standardization check results at least 80% of the established standard response	D
11.113	GPS position checks within 0.3 meter	D
11.114	GPS base station set up and initialization IAW the Work Plan	D
11.115	Tests performed to ensure radio linkage and reception by the GPS units	D
11.116	Equipment Quality Control documented IAW the Work Plan	D
11.200	***Field Operations***	
11.201	Logical and consistency file naming convention maintained.	D
11.202	Naming conventions and data structure properly recorded in log books.	D
11.203	Changes to instrument configuration, including operator, documented in field logs.	D
11.204	Field teams utilizing techniques to maintain proper line spacing IAW the Work Plan.	D
11.205	Survey system speed appropriate for required data density and signal-to-noise ratio.	D
11.206	Field teams practicing appropriate techniques to minimize EM noise.	D
11.207	Synchronization between geophysical sensors and positioning system monitored and documented in daily log.	D
11.208	Drift and functionality of the sensors were monitored during data collection.	D
11.209	Data was collected following a continuous progression along the survey lanes.	D
11.210	Causes of deviation from planned transect and the actual mode of progression are fully described in the field logbook notes.	D
11.211	Data collection activities were recorded by the field crew on daily log sheets, including sketch maps and observations of site environment condition.	D
11.300	***Data Processing***	
11.301	Logical and consistent file naming convention observed.	D
11.302	Naming convention and data structure recorded in processing log.	D
11.303	Instrument sampling rate and survey speeds appropriate for reliable detection of subsurface MEC.	D

11.304	GPS sampling rates, survey speed, and instrument sampling rate allow accurate positioning of data.	D
11.305	Sensor data evaluated for time gaps and sensor failure	D
11.306	Data dropouts are less than 2% of the potential data acquired.	D
11.307	Data volume for each receiver array is comparable (±1 percent).	D
11.308	Static data were evaluated and digital images of profiles showing system response versus time were generated.	D
11.309	Edits/corrections to the data are documented in processing log.	S
11.310	Data filters were applied and documented as specified in the Work Plan.	D
11.311	Data gridding algorithms were applied and documented as specified in the Work Plan	D
11.312	Data processing search radii, number of data points and patterns (e.g., quadrants, ellipticity, etc.) were applied and documented as specified in the Work Plan.	D
11.313	Profile data (response vs. time) were examined for unusual and non-geophysical responses	D
11.314	Review of data statistics and measurement coordinates (location accuracy)	D
11.315	Contour/image/profile plots generated.	S
11.316	Data processing steps accurately documented (processing log).	D
11.400	***Data Validation***	
11.401	All data specified by the Work Plan were captured and processed.	D
11.402	Station spacing along each lane or transect was IAW the Work Plan	D
11.403	The spatial data density (measurements per unit distance) is representative of the mapping effort described in the daily log.	D
11.404	Data delivered matches the field log description of the data collected, and discrepancies are resolved.	S
11.405	GPS data has sufficiently low PDOP or horizontal resolution error to ensure locations are accurate to less than 0.5 m	D
11.406	Field data were accurately located and show good/acceptable correspondence to known references and/or features at the project site.	D
11.407	Data statistics were evaluated with reference to the number of targets in the reviewed data set.	D
11.408	Atypical noise responses were identified and any degradation of detection resolution addressed in quality documentation.	S

11.409	Responses typical of instrument or geologic noise but not metallic sources were not included in target list.	D
11.410	Target selection limited to discrete, closed contour anomalies with shape disparate from the geologic background response or clutter trends.	D
11.411	Data were examined for target locations omitted by the automated routines or to delete obvious non-MEC-related anomalies.	D
11.412	Data for false positive (No Contact) dig results were extracted from database and evaluated/resolved.	D
11.413	MEC field anomaly map and digital data image (for a sample population of the anomalies investigated) is representative of intrusive sampling results.	D
12.000	**MEC Operations**	
12.010	Reacquisition teams trained to use reacquisition instrumentation IAW the Work Plan in conditions extant at the project site.	I, D
12.020	Anomaly location reacquisition performance criteria were defined prior to relocating anomalies.	I
12.030	Reacquisition performance criteria specified in Work Plan were achieved.	D
12.040	Minimum Separation Distance (MSD) is based on the Munition with the Greatest Fragmentation Distance (MGFD).	I, D
12.050	MSD physically marked/identified/established prior to commencing MEC operations.	D
12.060	Hand-held metal detector used to ensure personnel safety during anomaly explorations.	D
12.070	Near-surface anomalies are being manually excavated IAW the Work Plan.	D
12.080	Deeper Anomalies are being investigated using mechanical methods IAW the Work Plan.	S
12.090	Discovered MEC is identified, marked, and handled appropriately.	D
12.100	MEC Disposal Operations Team organized IAW the on-site work plan?	S
12.110	MEC identification and disposal conducted by the Disposal Operations Team.	S
12.120	Determination of safe-to-move made IAW the Work Plan.	S
12.130	MEC disposal conducted IAW the Work Plan.	S, D
12.140	Removal and disposal of MEC scrap conducted IAW the Work Plan.	S, D
12.150	Turn-in/disposal of safe-certified scrap IAW the Work Plan.	S

13.000	**Quality Management**	
13.010	Ongoing Safety and Health (S&H) Training Program established and communicated to project personnel.	I, S
13.020	QMS process/training plan for all project personnel accomplished to ensure each employee meets the qualifications requirements (education, training, and/or experience), as defined for this contract to perform the duties of the job for which they were hired IAW the Work Plan.	I, S
13.030	Site-specific training requirements for contractor personnel and site visitors provided IAW the Work Plan.	I, S
13.040	QMS audit training conducted for all surveillance and monitoring personnel IAW the Work Plan.	I
13.050	Contract submittals (reports, work plans, etc.) are reviewed/processed to ensure they meet contractual requirements; changes to existing documents are processed and communicated to appropriate personnel.	S
13.060	All operable field changes and modifications to Work Plan approved and posted.	S, M
13.070	Results of the geophysical investigation tracked on a master spreadsheet that tabulates survey area identification, coordinates, and date surveyed.	D
13.080	All MEC and MEC scrap were processed IAW the MEC Process Flowchart and procedures established in the Work Plan.	S, D
13.090	Field confirmation sampling conducted IAW the Work Plan.	D
13.100	Work progress documented IAW the site work plan.	D
13.110	Field Operations Manager, UXOQC, Site Safety, SUXOS, UXOQC, and Team Leader (MEC, Geophysics, Reacq) field logs complete and up to date.	D
13.120	Field QMS documentation reviewed IAW the Work Plan schedule.	W
13.130	QC audits/inspections completed, and recorded as required.	D
13.140	All after-action activities conducted as indicated by the project schedule.	S
13.150	All technical and management data reviewed and annotated as acceptable before submittal.	S
14.000	**Deliverables**	
14.010	Deliverables associated with the data completed and packaged as specified in Work Plan.	S
14.020	QC documentation submitted as part of the supporting documentation for the final report.	S
14.030	QC records and documentation maintained on site and available for customer inspection upon request.	M
14.040	Data transmitted to the Customer in accordance with the Work Plan.	S

Key: I = Initial, D = Daily, W = Weekly, M = Monthly, S = Situational (as required)

MARRS

MOJAVE GUNNERY RANGE "C"
Remedial Investigation
California City, CA
USACE Contract Number: W912PL-06-D-0008

Initial Quality Control Inspection
Date: _____

Item No.	QMS Item Description	Reference	Compliant	Non-Compliant
1.000	**Project Documents Required On-Site**			
1.010	Regulatory Documents/Orders			
1.020	Site-Specific Safety and Health Plan and Addenda			
1.030	Explosive Safety Submission			
1.040	Work Plan			
1.050	Technical Project Plan			

2.000	**Pre-Mobilization**			
2.010	Contract and all modifications and change orders up-to-date and approved.			
2.020	Letter authorizing project start-up received and copied to project files.			
2.030	Contractual definable features of work established and agreed upon between MARRS and the **customer** (what they want, and what and how we will provide it).			
2.040	Contractual definable features of work established and agreed upon between MARRS and its **subcontractors** (what we want, and what and how they will provide it).			
2.050	Data Quality Objectives established (project requirements and method(s) of measuring achievement defined) and approved by MARRS and the customer.			
2.060	Depth of investigation/clearance identified.			
2.070	Investigative/clearance area defined.			
2.080	MEC of concern identified and clearance criteria defined.			
2.090	File on all UXO qualified personnel to include: NAVSCOLEOD cert., up to date physical, 40-hr HAZWOPER cert., up to date 8-hr HAZWOPER cert.			
2.100	File on SUXOS, QC, SSO, and all UXOSs, a copy of an 8-hr HAZWOPER supervisor cert.			

Item No.	QMS Item Description	Reference	Compliant	Non-Compliant
2.110	Personnel approval letter for all UXO personnel on site.			
2.120	Necessary procurements completed.			
2.130	QA/QC management system established.			
2.140	Preparatory Phase Readiness Review completed.			

3.000	**Equipment Maintenance/Functional Checks**			
3.040	Demolition equipment inspected and serviceable.			

4.000	**Safety**			
4.050	Hazard Analysis and Risk Assessment for all project tasks and on-site equipment.			
4.060	Copies of MSDSs for all hazardous substances used and/or stored on site.			
4.080	First Aid and CPR training certificate (required to have a minimum of two qualified personnel on site when field activities are taking place).			
4.130	Approved containers for flammable storage used.			
4.150	Adequate work space and restroom facilities.			
4.160	Maximum personnel occupancy limits maintained at on-site office facilities.			
4.190	Emergency Notification List (ENL) in each site vehicle and available to all personnel.			
4.200	Tools adequate and serviceable.			
4.210	Fire exits marked and not blocked.			
4.230	Department of Defense Notice to Airmen (NOTAM) forwarded to the area Federal Aviation Administration			

5.000	**Site Management**			
5.010	Licenses and permits as required - HR, EOE, H&S, etc. documents prominently posted.			
5.020	All personnel thoroughly trained in the performance of their work and the collection of any data for which they are responsible.			
5.080	MEC demolition site selected and prepared prior to the start of field operations.			
5.090	Names and contact procedures for First Aid/CPR-qualified on-site project personnel posted in field office.			
5.100	Required personnel on-site.			

Item No.	QMS Item Description	Reference	Compliant	Non-Compliant
5.110	Database designed and established.			
5.130	Initial Phase Readiness Review completed and unimplemented items identified.			

6.000	**Transportation of Explosive Materials**			
6.010	Motor vehicle inspection performed.			

7.000	**Explosives Management**			
7.010	End user is certifying use in writing.			
7.030	MEC Magazine Data Cards maintained up-to-date.			
7.040	Proper magazine type used.			
7.050	Explosive Acquisition Plan in place before starting field operations.			
7.060	Approved MEC/explosive storage facilities used on site.			
7.070	Explosive compatibility maintained.			
7.080	Initial receipt procedures and documentation procedures on site and followed.			
7.090	A list of persons authorized to receive, issue and transport explosives will be maintained on-site.			
7.100	Magazine site meets all BATF, state, and local requirements			
7.110	Magazine NEW is maintained at or below the established weight at all times.			
7.120	Receipt procedures accounting for each explosive item received have been established.			
7.130	Fire-fighting control plan established and posted.			
7.140	Proper fire division symbol at entrance to storage site.			
7.150	Area around magazine free of rubbish, brush, dry grass, trees, for a minimum of 25 feet.			
7.160	Physical security and key control plan in place.			
7.170	Explosives licenses and permits posted in field office.			
7.180	End user certification of explosives use.			

8.000	**Geographic Information System**			
8.040	Utilization of standardized naming conventions.			

9.000	**Site Preparation**			
9.010	Vegetation cleared IAW site work plan.			
9.030	Grids marked IAW site work plan.			

Item No.	QMS Item Description	Reference	Compliant	Non-Compliant
9.050	Location and surveys were conducted IAW the site work plan.			
9.060	"Class 1, Third Order" or better used to establish for the network monuments.			
9.070	Control points identified on a map by name and number.			
9.080	Requisite site preparation activities are complete prior to initiation of subsequent, sequential activities (e.g., grids are established, marked, cleared, and recorded before geophysical detection and mapping systems are deployed; MSDs are identified and established prior to MEC operations).			
10.000	**Audit Activities**			
10.010	Audit Plan prepared and approved.			
11.100	***Equipment Quality Control***			
11.101	Instrument nulling location identified IAW Work Plan.			
12.000	**MEC Operations**			
12.010	Reacquisition teams trained to use reacquisition instrumentation IAW Work Plan in conditions extant at the project site.			
12.020	Anomaly location reacquisition performance criteria were defined prior to relocating anomalies.			
12.040	Minimum Separation Distance (MSD) is based on the Most Probable Munition (MPM).			
13.000	**Quality Management**			
13.010	Ongoing Safety and Health (S&H) Training Program established and communicated to project personnel.			
13.020	QMS process/training plan for all project personnel accomplished to ensure each employee meets the qualifications requirements (education, training, and/or experience), as defined for this contract to perform the duties of the job for which they were hired IAW Work Plan.			
13.030	Site-specific training requirements for contractor personnel and site visitors provided IAW Work Plan.			
13.040	QMS audit training conducted for all surveillance and monitoring personnel IAW Work Plan.			

Item No.	Comments

QC Manager _____ Date _____

Project Manager _____ Date _____

13360 Firestone Boulevard, Suite 2A, Santa Fe Springs, CA 90670
Phone (562) 407-1094

MOJAVE GUNNERY RANGE "C"
Remedial Investigation
California City, CA
USACE Contract Number: W912PL-06-D-0008

Daily Quality Control Inspection
Date: _____

Item No.	QMS Item Description	Reference	Compliant	Non-Compliant
3.000	**Equipment Maintenance/Functional Checks**			
3.010	Instrument operational checks accomplished daily IAW the Work Plan.			
3.020	Equipment calibrated and tested prior to use IAW the Work Plan.			
3.030	GPS systems inspected and serviceable.			
3.050	Vehicle communications inspected and serviceable.			
3.060	Hand and power tools inspected and serviceable.			

4.000	**Safety**			
4.010	PPE being provided and used properly on site.			
4.040	Heavy equipment inspected and serviceable.			
4.070	Equipment operated to prevent impact with MEC.			
4.100	Two separate means of on-site communications inspected and serviceable.			
4.110	Personnel protective equipment (PPE) for all on-site personnel to include visitors.			
4.120	PPE adequate and serviceable and used.			
4.140	Heavy equipment is used IAW the procedures established in the site work plan.			
4.170	First-aid equipment immediately available to all on-site personnel.			
4.180	Emergency eye wash immediately available to all on-site personnel.			
4.200	Tools adequate and serviceable.			
4.210	Fire exits marked and not blocked.			
4.220	Fire extinguishers posted as required in all on-site vehicles, and in all on-site buildings.			

Item No.	QMS Item Description	Reference	Compliant	Non-Compliant
5.000	**Site Management**			
5.030	Good housekeeping maintained.			
5.050	SUXOS on site during all field operations.			
5.060	All required equipment on-site and operational.			
5.070	All required facilities on-site functional.			
5.100	Required personnel on-site.			
5.110	Database designed and established.			
5.120	Daily Field logs established for all on-site supervisors and above, and maintained as project property and reviewed and initialed daily by the site manager or designee.			

6.000	**Transportation of Explosive Materials**			
6.020	Vehicles transporting explosives display all required placards, lettering, and numbers required.			
6.030	Operators transporting explosives have valid driver's license and current CDL.			
6.040	Transported loads blocked and braced.			
6.050	First-aid kit and 2 10 lb. Fire extinguishers rated for BC fires maintained in the vehicle.			
6.060	No flame-producing articles in explosives transport vehicle or on persons conducting transport, or handling the explosives.			
6.070	Vehicle communications established and maintained.			
6.080	Explosives compatibility constraints observed.			

12.000	**MEC Operations**			
12.010	Reacquisition teams trained to use reacquisition instrumentation IAW the Work Plan in conditions extant at the project site.			
12.030	Reacquisition performance criteria specified in Work Plan were achieved.			
12.040	Minimum Separation Distance (MSD) is based on the Munition with the Greatest Fragmentation Distance (MGFD).			
12.050	MSD physically marked/identified/established prior to commencing MEC operations.			
12.060	Hand-held metal detector used to ensure personnel safety during anomaly explorations.			
12.070	Near-surface anomalies are being manually excavated IAW the Work Plan.			
12.090	Discovered MEC is identified, marked, and handled appropriately.			

Item No.	QMS Item Description	Reference	Compliant	Non-Compliant
12.130	MEC disposal conducted IAW the Work Plan.			
12.140	Removal and disposal of MEC scrap conducted IAW the Work Plan.			

13.000	**Quality Management**			
13.070	Results of the geophysical investigation tracked on a master spreadsheet that tabulates survey area identification, coordinates, and date surveyed.			
13.080	All MEC and MEC scrap were processed IAW the MEC Process Flowchart and procedures established in the Work Plan.			
13.090	Field confirmation sampling conducted IAW the Work Plan.			
13.100	Work progress documented IAW the site work plan.			
13.110	Field Operations Manager, UXOQC, Site Safety, SUXOS, UXOQC, and Team Leader (MEC, Geophysics and Reacq) field logs complete and up to date.			
13.130	QC audits/inspections completed, and recorded as required.			

Item No.	Comments

Quality Control Specialist _____ Date _____

SUXOS/SM _____ Date _____

MARRS

MOJAVE GUNNERY RANGE "C"
Remedial Investigation
California City, CA
USACE Contract Number: W912PL-06-D-0008
Weekly Quality Control Inspection
Date: _____

Item No.	QMS Item Description	Reference	Compliant	Non-Compliant
4.000	**Safety**			
4.020	Maps posted identifying the proper MSD for each clearance area.			
4.030	Emergency Route Maps posted and provided to all on-site personnel.			
4.130	Approved containers for flammable storage used.			

5.000	**Site Management**			
5.040	Records of activities performed and project data maintained.			

7.000	**Explosives Management**			
7.020	MEC inventory Inspection conducted weekly.			

8.000	**Geographic Information System**			
8.010	Posting of data for each activity to GIS map.			
8.020	Records of metadata maintained.			
8.030	Ensuring that the project database is updated at least weekly throughout the duration of the field project.			

13.000	**Quality Management**			
13.120	Field QMS documentation reviewed IAW the Work Plan schedule.			

13360 Firestone Boulevard, Suite 2A, Santa Fe Springs, CA 90670
Phone (562) 407-1094

Item No.	Comments

Quality Control Specialist

Date

SUXOS/SM

Date

13360 Firestone Boulevard, Suite 2A, Santa Fe Springs, CA 90670
Phone (562) 407-1094

MARRS

MOJAVE GUNNERY RANGE "C"
Remedial Investigation
California City, CA
USACE Contract Number: W912PL-06-D-0008

Monthly Quality Control Inspection
Date: _____

Item No.	QMS Item Description	Reference	Compliant	Non-Compliant
1.000	**Project Documents Required On-Site**			
1.010	Regulatory Documents/Orders			
1.020	Site-Specific Safety and Health Plan and Addenda			
1.030	Explosive Safety Submission			
1.040	Work Plan			
1.050	Technical Project Plan			

2.000	**Pre-Mobilization**			
2.010	Contract and all modifications and change orders up-to-date and approved.			
2.090	File on all UXO qualified personnel to include: NAVSCOLEOD cert., up to date physical, 40-hr HAZWOPER cert., up to date 8-hr HAZWOPER cert.			
2.110	Personnel approval letter for all UXO personnel on site.			

4.000	**Safety**			
4.050	Hazard Analysis and Risk Assessment for all project tasks and on-site equipment.			
4.060	Copies of MSDSs for all hazardous substances used and/or stored on site.			
4.080	First Aid and CPR training certificate (required to have a minimum of two qualified personnel on site when field activities are taking place).			
4.150	Adequate work space and restroom facilities.			
4.160	Maximum personnel occupancy limits maintained at on-site office facilities.			
4.190	Emergency Notification List (ENL) in each site vehicle and available to all personnel.			
5.000	**Site Management**			
5.010	Licenses and permits as required - HR, EOE, H&S, etc. documents prominently posted.			
5.020	All personnel thoroughly trained in the performance of their work and the collection of any data for which they are responsible.			
5.090	ENL and contact procedures for First Aid/CPR-qualified on-site project personnel posted in field office.			

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Item No.	QMS Item Description	Reference	Compliant	Non-Compliant
7.000	**Explosives Management**			
7.040	Proper magazine type used.			
7.090	A list of persons authorized to receive; issue and transport explosives will be maintained on-site.			
7.100	Magazine site meets all BATF, state, and local requirements			
7.110	Magazine NEW is maintained at or below the established weight at all times.			
7.140	Proper fire division symbol at entrance to storage site.			
7.150	Area around magazine free of rubbish, brush, dry grass, trees, for a minimum of 25 feet.			
7.160	Physical security and key control plan in place.			
7.170	Explosives licenses and permits posted in field office.			
7.180	End user certification of explosives use.			

13.000	**Quality Management**			
13.060	All operable field changes and modifications to Work Plan approved and posted.			

14.000	**Deliverables**			
14.030	QC records and documentation maintained on site and available for customer inspection upon request.			

Item No.	Comments

Quality Control Specialist _____ Date _____

SUXOS/SM _____ Date _____

MOJAVE GUNNERY RANGE "C"
Remedial Investigation
California City, CA
USACE Contract Number: W912PL-06-D-0008
Situational (as required) Quality Control Inspections
Date: _____

Item No.	QMS Item Description	Schedule Date	Reference	Compliant	Non-Compliant
2.000	**Pre-Mobilization**				
2.070	Investigative/clearance area defined.				
3.000	**Equipment Maintenance/Functional Checks**				
3.040	Demolition equipment inspected and serviceable.				
4.000	**Safety**				
4.090	Tasks requiring MEC escort identified.				
5.000	**Site Management**				
5.140	Final Readiness Review complete and all items resolved.				
5.150	Digital data backups conducted IAW the Work Plan.				
5.160	Property Management QC Checks: 1. Property and equipment stored in lockable containers or inside office trailers? 2. Property tracking log established and maintained? 3. Property log attached to weekly reports? 4. Property lost, damaged, or destroyed reported to Project Manager?				
6.000	**Transportation of Explosive Materials**				
6.010	Motor vehicle inspection performed.				
6.020	Vehicles transporting explosives display all required placards, lettering, and numbers required.				
6.030	Operators transporting explosives have valid driver's license and current CDL.				
6.040	Transported loads blocked and braced.				
6.050	First-aid kit and 2 10 lb. Fire extinguishers rated for BC fires maintained in the vehicle.				
6.060	No flame-producing articles in explosives transport vehicle or on persons conducting transport, or handling the explosives.				

Item No.	QMS Item Description	Schedule Date	Reference	Compliant	Non-Compliant
6.070	Vehicle communications established and maintained.				
6.080	Explosives compatibility constraints observed.				
7.000	**Explosives Management**				
7.030	MEC Magazine Data Cards maintained up-to-date.				
7.060	Approved explosive storage facilities used on site.				
7.070	Explosive compatibility maintained.				
7.080	Initial receipt procedures and documentation procedures on site and followed.				
7.110	Magazine NEW is maintained at or below the established weight at all times.				
8.000	**Geographic Information System**				
8.040	Utilization of standardized naming conventions.				
9.000	**Site Preparation**				
9.020	Grid stake locations checked with geophysical equipment prior to driving monument stakes.				
9.040	MEC scrap and metallic debris larger that 1" by 2" removed and placed in the SW corner of the grid or other identified collection area.				
10.000	**Audit Activities**				
10.020	Scheduled audits accomplished.				
10.030	Audit findings submitted for review.				
10.040	Corrective actions and/or follow-on activities implemented.				
10.050	Audit Close-out completed.				
11.300	***Data Processing***				
11.309	Edits/corrections to the data are documented in processing log.				
11.315	Contour/image/profile plots generated.				
11.400	***Data Validation***				
11.404	Data delivered matches the field log description of the data collected, and discrepancies are resolved.				
11.408	Atypical noise responses were identified and any degradation of detection resolution addressed in quality documentation.				
12.000	**MEC Operations**				
12.080	Deeper Anomalies are being investigated using mechanical methods IAW the Work Plan.				
12.100	MEC Disposal Operations Team organized IAW the on-site work plan?				

12.110	MEC identification and disposal conducted by the Disposal Operations Team.				

Item No.	QMS Item Description	Schedule Date	Reference	Compliant	Non-Compliant
12.120	Determination of safe-to-move made IAW the Work Plan.				
12.130	MEC disposal conducted IAW the Work Plan.				
12.140	Removal and disposal of MEC scrap conducted IAW the Work Plan.				
12.150	Turn-in/disposal of safe-certified scrap IAW the Work Plan.				

13.000	**Quality Management**				
13.010	Ongoing Safety and Health (S&H) Training Program established and communicated to project personnel.				
13.020	QMS process/training plan for all project personnel accomplished to ensure each employee meets the qualifications requirements (education, training, and/or experience), as defined for this contract to perform the duties of the job for which they were hired IAW the Work Plan.				
13.030	Site-specific training requirements for contractor personnel and site visitors provided IAW the Work Plan.				
13.050	Contract submittals (reports, work plans, etc.) are reviewed/processed to ensure they meet contractual requirements; changes to existing documents are processed and communicated to appropriate personnel.				
13.060	All operable field changes and modifications to Work Plan approved and posted.				
13.080	All MEC and MEC scrap were processed IAW the MEC Process Flowchart and procedures established in the Work Plan.				
13.140	All after-action activities conducted as indicated by the project schedule.				
13.150	All technical and management data reviewed and annotated as acceptable before submittal.				

14.000	**Deliverables**				
14.010	Deliverables associated with the data completed and packaged as specified in Work Plan.				
14.020	QC documentation submitted as part of the supporting documentation for the final report.				
14.040	Data transmitted to the Customer in accordance with the Work Plan.				

Item No.	Comments

Quality Control Manager

Date

Project Manager

Date

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Phone (562) 407-1094

MOJAVE GUNNERY RANGE "C"
Remedial Investigation
California City, CA
USACE Contract Number: W912PL-06-D-0008

QUALITY CONTROL DAILY REPORT

Day/Date:

Name/Location of Work Area/s:
Weather Conditions:_____ Temperature: Low: __High: ___

1. **WORK PERFORMED TODAY:** (Indicate location and description of activity performed)

   Demo Operations:

   Reacquisition: Site support.
   Completed ____ Total points.

2. **SUBCONTRACTOR ACTIVITIES:**

3. **PREPARATORY INSPECTION:**

4. **INITIAL INSPECTION:** (Address quality of work. Assure personnel and equipment is in compliance with the Work Plan).

5. **FOLLOW-UP INSPECTION:** (Assure control testing performed as required and all work performed continues to be in compliance with the Work Plan.)

6. **QC AUDITS AND ACTIVITIES: (Follow-up phase)**
   UXOQC
   PPE Audit:

   OE SCRAP Inspection:
   Project Conformance Audit Check List: Completed ___ Yes __No
   QC Performed: Site/s: No. of Grids QC'd:__Pass___Fail. **Grids OE QC'd:**
   Total grids Complete OE QC to date are _.
   Total grids failed OE QC to date are ___. Failed grids revisited and passed are __. Total grids in Grids in failure Status to date is __.

   Third Party QA Assist (Grids): See QA daily report.
   GEOQC : See Geo QC daily report.

7. **WRITTEN/VERBAL INSTRUCTIONS RECEIVED:** List any instructions given by third party QA/USACE Personnel.

8. **MAGAZINE SECURITY CHECK:** Time: _____ By: UXOQC_____UXOSO___OTHER____
   MAGAZINE FIRE EXTINGUISHER CHECKS: Date Last Checked:

9. **RESULTS OF SAFETY INSPECTION AND/OR SAFETY MEMO/S:** See attached sheets.

10. **UPCOMING WORK:** (Indicate next site/s to be worked, status of preparatory inspection and pertinent inspections pending/conducted).

EQUIPMENT STATUS

DISCRIPTION	QTY ON HAND	QTY IN USE	QTY DOWN FOR REPAIRS	QTY ON STANDBY
a. Schonstedt				
b. Fischer's				
c. Garrets				
d. Van, Trucks				
e. EM 61				
f. OHV				
g. Trimble, base				
h. Trimble, rover				
i. Radios, Motorola				

CONTRACTOR CERTIFICATION: On behalf of the Contractor, I certify that this report is complete and correct, and equipment and materials used and work performed during this reporting period is in compliance with the contract drawings and Specifications to the best of my knowledge except as noted in this report.

_____

MARRS Approved/Authorized Representative

Cc: USACE/QA (Electronic)
SUXOS
PM (Site files)

MOJAVE GUNNERY RANGE "C"
Remedial Investigation
California City, CA
USACE Contract Number: W912PL-06-D-0008

UXO QUALITY CONTROL INSPECTION AND AUDIT LOG

DATE:	TIME:	LOG #:
WEATHER CONDITION:		

A. AREAS INSPECTED: (Listed by grid number, coordinates or description)

B. INSPECTION RESULTS:

C. CORRECTIVE ACTIONS RECOMMENDED (If required):

D. REINSPECTION RESULTS (If required):

E. SIGNATURES:	I acknowledge that I have been briefed on the results of this inspection and will take corrective actions (if necessary).
Quality Control Specialist	SUXOS/SM

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MOJAVE GUNNERY RANGE "C"
Remedial Investigation
California City, CA
USACE Contract Number: W912PL-06-D-0008

UXO QUALITY CONTROL NONCONFORMANCE REPORT (NCR)

DATE:	TIME:	NCR #:

A. IDENTIFICATION OF NCR:
Quality Control Specialist/Auditor

B. EVALUATION OF NCR (by PM and QC Manager) REMARKS:	
Quality Control Manager	Project Manager

C. CORRECTIVE ACTIONS RECOMMENDED (by QC Manager):	
Corrective Actions Recommendation Approved:	
Quality Control Manager	Project Manager

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D. APPROVED CORRECTIVE ACTIONS CONDUCTED AND COMPLETED:	
Signature Signifying Completion	
NCR CLOSEOUT SIGNATURES: Signatures Signify Corrective Actions Completed to Satisfaction.	
Quality Control Manager	Project manager

Field Change Request

Field Change # _____ Rev # _____
Page _____ of _____

Project Name Mojave Gunnery Range "C" Remedial Investigation
USACE Contract Number W912PL-06-D-0008
Applicable Document _____ **Date** _____

Description:

Minor Change ☐ Major Change ☐ Major Project Impact ☐

Requested By: _____

Reason for Change

Recommended Disposition:

Impact on Present and Completed Work

Cost Impact

Accepted ☐ Rejected ☐ Rework ☐ _____ Date _____
Project Manager

Accepted ☐ Rejected ☐ Rework ☐ _____ Date _____
Geo QC Manager

Accepted ☐ Rejected ☐ Rework ☐ _____ Date _____

Concur ☐ No concur ☐ Rework ☐ _____ Date _____
USACE Project Manager

Concur ☐ No concur ☐ Rework ☐ _____ Date _____
USACE QA

Remarks

Final Disposition

Signature _____ Date _____

MOJAVE GUNNERY RANGE "C"
Remedial Investigation
California City, CA
USACE Contract Number: W912PL-06-D-0008
Tailgate Safety Briefing

Date:

Briefing Conducted By (Printed):	Signature:	Time:

This sign-in log documents the tailgate safety briefing conducted in accordance with 29 CFR 1910.120 "Hazardous Waste Operations and Emergency Response" as well as other applicable regulatory requirements. Personnel who perform work operations onsite are required to attend each safety briefing and acknowledge receipt of such briefings daily.

TOPICS COVERED:

General PPE usage (Gloves, Eye Protection, Safety Vest, Hard Hat)

Hearing Protection (Will be worn while operating machinery)

OE/UXO Safety (Do not touch, pick up any range debris)

Situational Awareness (Slips, Trips, and Falls)

Emergency Procedures (Location of 1st Aid Kit and Hospital (Strip Map), Phone Numbers of Key Personnel)

Heat Stress (Discuss symptoms and preventive measures)

Personal Hygiene (Wash Hands prior to eating or smoking)

Smoking, Eating, and Drinking (Identify locations of listed areas)

EM-61 Hazards (Batteries, Cart Width, Wide Turns and Backing)

Gator Hazards (Parking break, Roll Over, Fuel Spills, Noise)

Other (ie. Heavy Equipment Operations)

ADDITIONAL TOPICS COVERED:
Planned Work:
Special Precautions:

Personnel Sign-in List

Name	Signature	Position (UXO/GEO)	

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MOJAVE GUNNERY RANGE "C"
Remedial Investigation
California City, CA
USACE Contract Number: W912PL-06-D-0008

SAFETY BRIEFING ATTENDANCE RECORD

Topic of Training Session:_____
(attach a copy of the training session curriculum)

Briefing Conducted By:	Date:	Time:

We are legally required to maintain records regarding our safety training activities. Please assist us by providing the information indicated below to document your attendance. Thank you.

Name *(Please Print)*	Company	Signature
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		

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MARRS

MOJAVE GUNNERY RANGE "C"
Remedial Investigation
California City, CA
USACE Contract Number: W912PL-06-D-0008

Safety Inspection Report

Date:

Location (Area of Operations): _____

Type of Inspection: _____ **Daily** _____ **Weekly** _____ **Re- Inspection** _____ **Other**

Activity Inspected: _____

_____

Safety/Operational Equipment Inspected: _____

_____

_____

Comments: _____

_____

_____

***Deficiencies Found or Noted:** _____

_____

_____

***Corrective Action:** _____

_____

_____

Re-Inspection Required: ___ **Yes** ___ **No** **If yes, date of re-inspection** ___/___/___

Signatures: _____ _____

Site Safety Officer **SUXOS/Project Manager**

***Copy to Supervisor if deficiencies or corrective action were found, noted or deemed necessary.**

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Phone (562) 407-1094

orm 301
and Illnesses Incident Report

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

U.S. Depar

Occupational Safety and Heal

Form approved C

*s Incident Repor*t is one of the
ill out when a recordable work-
s has occurred. Together with
ted injuries and Illnesses and
ummary, these forms help the
develop a picture of the extent
related incidents.
r days after you receive
ordable work-related injury or
you must fill out this form or an
ate workers' compensation,
eports may be acceptable
onsidered an equivalent form,
ontain all the information
n.
olic Law 91-596 and 29 CFR
keeping rule, you must keep
years following the year to

ional copies of this form, you
se as many as you need.

Date

Information about the employee

1) Full Name _____

2) Street _____

City _____ State _____ Zip _____

3) Date of birth _____

4) Date hired _____

5) ☐ Male
☐ Female

Information about the physician or other health care professional

6) Name of physician or other health care professional

_____

_____

7) If treatment was given away from the worksite, where was it given?

Facility _____

Street _____

City _____ State _____ Zip _____

8) Was employee treated in an emergency room?
☐ Yes
☐ No

9) Was employee hospitalized overnight as an in-patient?
☐ Yes
☐ No

Information about the case

10) Case number from the Log _____ *(Transfer the case number from the Log after you re*

11) Date of injury or illness _____

12) Time employee began work _____ AM/PM

13) Time of event _____ AM/PM ☐ Check if time cannot be determin

14) **What was the employee doing just before the incident occurred?** Describe the as the tools, equipment or material the employee was using. Be specific. Examples ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily entry."

15) **What happened?** Tell us how the injury occurred. Examples: "When ladder slipped worker fell 20 feet"; "Worker was spayed with chlorine when gasket broke during rep "Worker developed soreness in wrist over time."

16) **What was the injury or illness?** Tell us the part of the body that was affected and l affected; be more specific than "hurt", "pain", or "sore." Examples: "strained back"; " hand"; "carpal tunnel syndrome."

17) **What object or substance directly harmed the employee?** Examples: "concrete "radial arm saw." If this question does not apply to the incident, leave it blank.

18) **If the employee died, when did death occur?** Date of death

VEHICLE INSPECTION CHECKLIST

(To be used weekly for all vehicles EXCEPT explosive carriers which must be inspected prior to each explosives transport)

Site Name / Location: _____

SUXOS: _____ Inspector: _____ Vehicle: _____
(MAKE & LICENSE PLATE #)

Date Inspected: _____ Mileage: _____ Owner: _____
(RENTAL, EODT, GFE, CONTRACT)

USE ▯ FOR PASS, X FOR DISCREPANCY

1. DOCUMENTATION:	Pass	Fail	2. BRAKES:	Pass	Fail
Registration	[ ]	[ ]	Hand/Emergency	[ ]	[ ]
Insurance	[ ]	[ ]	Service	[ ]	[ ]
Emergency Route Map and Phone Numbers	[ ]	[ ]			
3. TIRES:			4. BELTS:		
Pressure	[ ]	[ ]	Proper tension	[ ]	[ ]
Condition	[ ]	[ ]	Condition	[ ]	[ ]
5. EQUIPMENT:			6. LIGHTS:		
Fire extinguishers*	[ ]	[ ]	Headlights (high & low)	[ ]	[ ]
First Aid/CPR/Burn	[ ]	[ ]	Brake Lights	[ ]	[ ]
Eyewash kits	[ ]	[ ]	Parking	[ ]	[ ]
Emergency Breakdown Kit	[ ]	[ ]	Back-up	[ ]	[ ]
Spare Tire	[ ]	[ ]	Turn Signals	[ ]	[ ]
Tire Changing Equipment	[ ]	[ ]	Emergency Flashers	[ ]	[ ]
Tie downs*	[ ]	[ ]			
Chocks*	[ ]	[ ]			
Placards*	[ ]	[ ]			
7. FLUID LEVELS:			8. GENERAL:		
Oil	[ ]	[ ]	Windshield Wipers	[ ]	[ ]
Coolant	[ ]	[ ]	Windshield/Windows	[ ]	[ ]
Brake	[ ]	[ ]	Seat Belts	[ ]	[ ]
Steering	[ ]	[ ]	Steering	[ ]	[ ]
Transmission	[ ]	[ ]	Horn	[ ]	[ ]
Windshield Wiper	[ ]	[ ]	Gas Cap	[ ]	[ ]
Fluid Leaks	[ ]	[ ]	Mirrors	[ ]	[ ]
			Cleanliness	[ ]	[ ]
			Exhaust system*	[ ]	[ ]

(Note: Items marked with * are required for explosive carriers and must be inspected prior to each use)

Description of deficiencies:_____

_____

_____

Deficiencies corrected by:_____ Date _____

EXPLOSIVE ACCOUNTABILITY RECORD
(Magazine Data Card)

Product Code/FSN		Nomenclature		Location		
Date Code/Lot NR		NR Package/Case		NR Cases		
Date	Bill Lading/Voucher NR	Rcvd. From/Issued To	Qty. Received	Qty. Issued	Balance	Initials
/ /						
/ /						
/ /						
/ /						
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/ /						

EXPLOSIVES PURCHASE/RECEIPT/TRANSPORTATION
AUTHORIZATION LIST

Address and County (Home Office):

Address and County: (Field Office)

Federal License #: Expiration Date:

The following persons are agents, employees, or representatives of the undersigned, and are authorized to order or acquire explosive materials on behalf of Engineering/Remediation Resources Group (ERRG), INC.:

Name and Home Address	Driver's License No.	Soc. Sec. Number	Place of Birth

The undersigned certifies the foregoing information to be true and correct to the best of his knowledge and believe, and that he will communicate any additions or deletions to the foregoing list to ERRG.

_____	_____
Corporate Officer	Date

DEMOLITION RECORD

Site Name/Location:			Date:
Shot Location (OB/OD Range or Grid No.):	Demolition Supervisor:	State License # (if applicable):	
Type of UXO/OE Destroyed, Vented, or Burned:		Firing Method:	Time of Shot:
Direction and Distance to Nearest Building, Road, Utility Line, etc.:		Temp: _____ Wind Dir./Speed: _____ Ceiling: _____ Clouds/Sun: _____	
Type and Amount of Tamping Used:		Mat or Other Protection Used (list):	
Seismographic/Sound Level Meter Used: Yes ☐ No ☐		Readings/Results:	

Demolition Materials Used

Description	Amount	Description	Amount
Perforator		Time Fuze	
Detonating Cord		Squibs	
Electric Detonator		Black/Smokeless Powder	
Non-Electric Detonator		Two Component	
NONEL Detonator		Other (list)	
High Explosive Type (list):			

Certification

I certify that the explosives listed were used for their intended purpose, and that the UXO/OE listed were rendered inert/destroyed.

Signature of Demolition Supervisor: _____ Date: _____

Los Angeles District

Munitions Constituents
Sampling and Analysis Plan (SAP)
Former Mojave Gunnery Range "C" RI/FS

Contract No. W91PL-06-D-0008 DO-0001

Project No. J09CA728101

Prepared for:

U.S. Army Corps of Engineers
Los Angeles District
915 Wilshire Blvd.
Los Angeles, CA 90017

FINAL

January 2008

Prepared by:

MARRS Services, Inc.
13360 Firestone Boulevard, Suite 2A
Santa Fe Springs, CA 90670

Rod Reeve, MARRS Quality Manager

MARRS

REVIEW AND APPROVAL

MARRS Project Manager:_____Date:_____

Chuck Welk

MARRS Project QC Manager: _____Date:_____

Rod Reeve

MARRS Project Chemist:_____Date:_____

Kirit Bhatt

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EXECUTIVE SUMMARY

This Sampling and Analysis Plan (SAP) and has been developed to support soil sampling in and around suspected MEC sites in the Mojave Gunnery Range "C" (MGRC) for the United States Army Corps of Engineers (USACE), Los Angeles District (CESPL). The SAP consists of a Field Sampling Plan and a Quality Assurance Project Plan. This Sampling and Analysis Plan has been prepared in accordance with the requirements of Data Item Description (DID) MR-005-10 and documents incorporated by reference, including EM-200-1-3 (USACE, 2001). During initial site visits of areas identified through a review of historical aerial photographs and an associated Archive Search Report (ASR) from 2002, Munitions and Explosives of Concern (MEC) was determined to be present within the MGRC. This SAP currently addresses ten sites within the MGRC. The MGRC RI/FS Work Plan has been developed to investigate the identified Munitions Response Areas (MRAs) with a comprehensive sampling methodology involving visual, geophysical and intrusive investigations to characterize where MEC activities occurred within each MRA. This SAP has been prepared as Appendix G to the MGRC RI/FS Work Plan.

According to a review of the ASR, the MGRC was used for both targeting and firing activities during past United States Department of Defense (DoD) activities. The purpose of the sampling and analysis activities is to determine if munitions constituents (MC) are present in soils at concentrations of potential concern that should be further evaluated. If it is determined that prior DoD activities have not adversely impacted the site with MC, then a recommendation will be made that No Further Action (NFA) for MC is appropriate.

Soil sampling locations will be determined by the results of surface visual and/or geophysical site inspections. As both visual and geophysical field activities progress, areas of potential contamination may be discovered. The visual or geophysical evidence indicating potential contamination may include; soil staining, impacted vegetation, impact craters, areas of heavy munitions concentrations, or geophysical anomalies. As this information becomes available, Technical Memorandums (Tech Memos) will be generated itemizing the proposed sampling locations and the number of samples for individual sample areas. These Tech Memos will be submitted through CESPL to regulatory personnel for concurrence. Actual site visits by regulatory personnel may be performed if warranted. The actual process and actions involved in the visual and geophysical surveys for each identified MRA are provided in Chapter 3 of the MGRC RI/FS Work Plan. If no visual or geophysical evidence are discovered, no sampling will be performed. Historical sampling at other sites contaminated with explosives residues have shown substantial small-scale variability, the sampling strategy presented in the SAP includes both surface and subsurface small-scale composite sampling. Samples will be analyzed for explosive residues in a fixed

laboratory using Environmental Protection Agency (EPA) Test Method 8330. If explosive residues are detected, additional analyses for heavy metals related to explosives will be performed utilizing EPA Test Method 6020.

Sampling for metals may be performed independently of explosives if evidence exists of other than explosive ordnance is observed or noted in the historical documentation. This may include small arms ammunition, or strafing type targets.

The actual analytes to be analyzed for at each individual MRA will be based on the potential contaminants associated with the munitions observed. These potential analytes will be determined based on the USACE database which identifies analytes associated with various munitions and has been provided to MARRS by the USACE. The Tech Memos, when submitted as discussed above, will contain the list of specific analytes for review by both CESPL and regulatory personnel.

TABLE OF CONTENTS

PART I FIELD SAMPLING PLAN

PART II QUALITY ASSURANCE PROJECT PLAN

APPENDICES

ACRONYMS

%R	percent recovery
°C	degrees Celsius
µg	microgram
ac	acres
APCI	atmospheric-pressure chemical ionization
ASR	archive search reports
ASTM	American Society of Testing and Materials
BIP	blow-in-place
CAS	Chemical Abstract Service
CCV	continuing calibration verification
CESPL	US Army Corps of Engineers, Los Angles District
CERCLA	Comprehensive Environmental Restoration Compensation and Liability Act
cm	centimeter
COC	chain of custody
COD	coefficient of determination
CRREL	Cold Regions Research and Engineering Laboratory
CWM	Chemical Warfare Material
DERP	Defense Environmental Restoration Program
DoD	United States Department of Defense
DQCR	Data Quality Control Report
DQO	data quality objectives
EDD	electronic data delivery
EDMS	Electronic Document Management System
EPA	United States Environmental Protection Agency
FSP	field sampling plan
ft	foot/feet
FUDS	formerly used defense sites
GPS	global positioning system
HE	high explosives
HEAT	High Explosive Anti-Tank
HMX	tetranitro tetrazacyclo-octane (i.e., Her Majesty's Explosive)

ACRONYMS (Continued)

HPLC	high performance liquid chromatography
ICP	inductively coupled plasma
ICV	initial calibration verification
ID	identification number
IDW	investigation-derived waste
in	inch
INPR	Inventory Project Report
kg	kilogram
km	kilometer
LCS	laboratory control sample
MARRS	MARRS Services, Inc.
MC	munitions constituents
MD	munitions debris
MDL	method detection limit
MEC	munitions and explosives of concern
mg	milligram
MGRC	Mojave Gunnery Range "C"
MRA	Munitions Response Areas
MS	matrix spike
MSD	matrix spike duplicate
NELAC	National Environmental Laboratory Accreditation Conference
NFA	no further action
OSHA	United States Occupational Safety and Health Administration
PDA	photodiode-array
PM	project manager
PPE	personal protective equipment
PQL	practical quantitation limit
PRG	preliminary remediation goal
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine (i.e., Royal Demolition Explosive)
RI/FS	Remedial Investigation/Feasibility Study

ACRONYMS (Continued)

RL	reporting limit
RPD	relative percentage of difference
RSD	relative standard deviation
SAP	sampling and analysis plan
SD	sample duplicate
SOP	standard operating procedure
SOW	scope of work
SSL	soil screening level
SUXOS	Senior UXO Supervisor
SW-846	Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (3^{RD} Edition)
Tech Memos	Technical Memorandums
TNT	2, 4, 6-trinitrotoluene
U.S.	United States
USACE	United States Army Corps of Engineers
UV	ultraviolet
UXO	unexploded ordnance
UXOQC/SO	UXO Quality Control/Safety Officer
µg/kg	micro grams per kilogram
µg/l	micro grams per liter

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Munitions Constituents
Sampling and Analysis Plan (SAP)
Former Mojave Gunnery Range "C" RI/FS

Contract No. W91PL-06-D-0008 DO-0001
Project No. J09CA728101

PART I

FIELD SAMPLING PLAN

INTRODUCTION

This sampling and analysis plan (SAP) has been prepared in compliance with the Performance Work Statement (PWS) under Contract W912PL-06-D-0008 0001 in support of the U.S. Army Corps of Engineers (USACE), Los Angles District (CESPL) and in accordance with the requirements of Data Item Description (DID) MR-005-10 and documents incorporated by reference, including EM-200-1-3 (USACE, 2001). The CESPL has Administrative Control and is managing all aspects of this project. A copy of the PWS dated February 2006 has been provided in Appendix A of the Mojave Gunnery Range "C" (MGRC) Remedial Investigation/Feasibility Study (MGRC RI/FS) Work Plan. The work required under this PWS is authorized under the Defense Environmental Restoration Program (DERP) for Formerly Used Defense Sites (FUDS) at the MGRC, California City, California.

This SAP consists of a Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP). The FSP presents the overall objectives of the study and provides general guidance for fieldwork by defining both the soil sampling and field data gathering methods to be used and the data quality objectives (DQOs) to be applied. The QAPP describes the analytical methods and measurements, quality assurance/quality control (QA/QC) protocols necessary to achieve the DQOs, and data assessment procedures for the evaluation and identification of any data limitations. Site-specific information regarding the site and its potential sources for contamination are discussed further in appropriate chapters of the MGRC RI/FS Work Plan (MARRS, 2007).

The MGRC is located approximately four miles east of Mojave, California and overlaps the southwestern corner of California City, California as shown in Figure 1-1, MGRC Location Map. The MGRC encompasses approximately 20,656 acres in Kern County.

The MGRC RI/FS Work Plan was developed to investigate ten Munitions Response Areas (MRAs) for the presence of Munitions and Explosives of Concern (MEC). If additional areas of concern become apparent during the performance of the MGRC RI/FS, they will be investigated following the same procedures outlined in this SAP. The MGRC RI/FS will involve comprehensive visual, geophysical and intrusive investigations to characterize where MEC activities occurred within each MRA. The actual process and actions involved in the visual and geophysical surveys are identified in Chapter 3 of the MGRC RI/FS Work Plan This SAP has been prepared to provide soil sampling protocols to evaluate if Munitions Constituents (MC) are present within identified MRAs and if they are present above levels that are of potential impact to human health and/or the environment. No surface water or groundwater sampling will be performed under this SAP. The soil sampling described herein will be performed based

on information derived from the MGRC RI/FS activities at the MGRC. As both visual and geophysical field activities progress, areas of potential contamination may be discovered. The visual or geophysical evidence indicating potential contamination may include; soil staining, impacted vegetation, impact craters, areas of heavy munitions concentrations (to include small arms ammunition), or geophysical anomalies. As this information becomes available, Technical Memorandums (Tech Memos) will be generated itemizing the proposed sampling locations and the number of samples for individual sample areas. These Tech Memos will be submitted to both CESPL and regulatory personnel for concurrence prior to the sampling events. Actual site visits by regulatory personnel may be performed if warranted. If no visual or geophysical evidence are discovered, no sampling will be performed.

The actual analytes to be analyzed for at each individual MRA will be based on the potential contaminants associated with the munitions observed. These potential analytes will be determined based on the USACE database which identifies analytes associated with various munitions. The metals to be analyzed for will be in accordance with Table 3-1 and Table A-6. The Tech Memos, when submitted as discussed above, will contain the list of specific analytes for review by both CESPL and regulatory personnel.

Work under this contract will be consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 104, and the National Oil and Hazardous Substance Pollution Contingency Plan, Sections 300.400 through 300.415 and 300.800 through 300.825.

1.0 PROJECT BACKGROUND

1.1 SITE HISTORY AND SOURCE OF POTENTIAL CONTAMINANTS

Ten MRAs have been identified for investigation during the Mojave Gunnery Range "C" (MGRC" Remedial Investigation/Feasibility Study (RI/FS) based on records reviews and site visits. Seven Munitions Response Areas (MRAs) were initially developed, based on target information provided in the "Archives Search Report (ASR) Findings for the Former Mojave Gunnery Range "C", Kern County, California, Project Number JO9CA728101, April 2002. Three additional MRAs were identified in accordance with the findings of the Draft Aerial Photo Analysis Site Visit Report, Former Mojave Gunnery Range "C" RI/FS, 19 March 2007 and three site visits by MARRS personnel performed prior to the development of this plan.

Existing information consists of the following:

1. Archive Search Report indicate the MGRC was used for bombing, strafing and targeting purposes
2. The Aerial Photo Analysis Report identified additional potential targets and munitions use areas
3. Aerial photographs and topographical maps of the area
4. Information received from interviews with local people
5. Observations obtained from three site visits based on the information above, where locations of potential sites have been identified.

Each of these sources of information was used to develop the approach documented in this SAP and the MGRC RI/FS Work Plan. Figure 1-1 is provided to reference the known and potential Munitions Response Areas (MRAs) which are the focus of the MGRC RI/FS.

A description of each MRA is provided below. Further detailed information is available in the MGRC RI/FS Work Plan (Chapter 1) and the Archives Search Report Findings for the Former Mojave Gunnery Range "C", Kern County, California, Project Number JO9CA728101, April 2002.

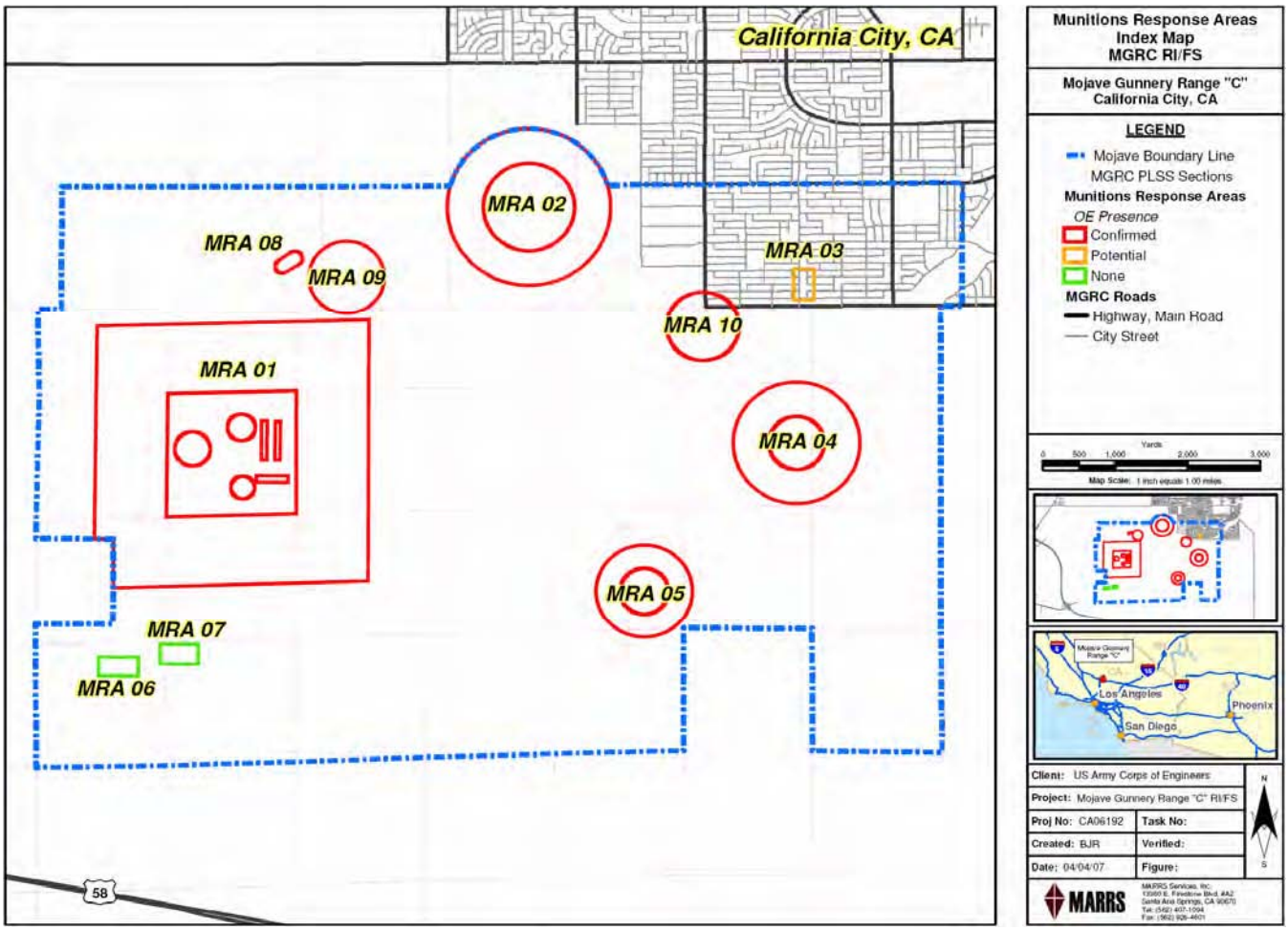

Figure 1-1. Mojave Gunnery Range "C" MRA Map

Specific Area(s) To Be Investigated

The general locations of the MRAs to be investigated are shown in Figure 1-1 and described below.

MRA-01, (Areas A and B)

MRA-01 is a cluster of targets (Area A) and buffer area (Area B) encompassing 2,906 acres (ac), of land as indicated in ASR J09CA728101. The occurrence of this target and buffer area within private land creates a substantial potential for public exposure to MEC originating from bombing targets. MRA-01 has confirmed MEC presence. Munitions confirmed are the 20mm target practice (TP) projectiles, MK 15 100-lb practice bombs, AN-MK23 3-lb. practice bombs, and 2.75-inch High Explosive (HE) Folding Fin Aerial Rockets (FFAR), and 2.75-inch Inert FFAR have been confirmed on this MRA.

MRA-02, (Areas C and D)

MRA-02 is suspected to have been a convoy target (Area C) made up of tanks and vehicles due to the vehicle debris located in the area and a buffer area (Area D) encompassing 828 ac as identified in ASR J09CA728101. The occurrence of this target and buffer area within private land creates a substantial potential for public exposure to MEC originating from bombing targets. MRA-02 has confirmed MEC presence. Munitions confirmed are evidence of high explosive bombs and rockets.

MRA-03, (Area E)

MRA-03 is a former 20-mm aircraft strafing range encompassing 26 ac of land as indicated in ASR J09CA728101. MRA-03 has potential MEC presence. The occurrence of this target within private land creates a substantial potential for public exposure to MEC originating from strafing targets. Munitions confirmed are the 20 mm TP projectiles.

MRA-04, (Areas F and G)

MRA-04 is a former bombing target (Area F) and buffer area (Area G) encompassing 499 ac) of land as indicated in ASR J09CA728101. The occurrence of this target and buffer area on private land creates a substantial potential for public exposure to MEC originating from bombing targets. MRA-04 has confirmed MEC presence. Munitions confirmed are the AN-MK23 3-lb practice bombs, 20mm TP projectiles; and 50 cal small arms ammunition.

MRA-05, (Areas H and I)

MRA-05 is a former rocket target (Area H) and a buffer area (Area I); encompassing 289 ac of land as indicated in ASR J09CA728101. The occurrence of this target and buffer area within private land creates a substantial potential for public exposure to MEC originating from rocket targets. MRA-05 has confirmed MEC presence. Munitions confirmed are the 2.25-inch practice rockets (SCAR), 2.75-inch FFAR, and 20mm TP projectiles. An intact VS-50 anti-personnel landmine was also located but it is believed to have been a result of an inadvertent drop resulting from mistaken coordinates with an adjacent range.

MRA-06, (Area J)

MRA-06 is a suspected bombing target encompassing 31ac of land as indicated in ASR J09CA728101. No evidence of munitions usage was encountered during previous site visits. This MRA is considered to have no MEC presence.

MRA-07, (Area K)

MRA-07 is a suspected bombing target encompassing 31 ac of land as identified in ASR J09CA0728101. No evidence of munitions usage was encountered during previous site visits. This MRA is considered to have no MEC presence.

MRA-08, (APA areas 5 and 6)

APA Areas 5 and 6 were described in the APA Addendum as "Targets with Concentric Rings Measuring 100 and 250 Feet in Diameter" The area the targets were reported to be in are approximately 2 ac each. During the visual inspection of the area, 2.25-inch rocket igniter leads and water/sand filled practice bomb debris were observed throughout the areas. After analysis of the data it was determined that APA Areas 5 and 6 may be an indication of a MRA. APA Areas 5 and 6 were combined due to their close proximity and recommended as additional an MRA with the addition of a 150 foot buffer around the 250 foot circles, and designated as MRA 08. The area of the resultant MRA-08 is approximately 16 ac. The occurrence of this target on private property creates a substantial potential for public exposure to MEC originating from this target.

MRA-09, (APA Area C)

APA Area C was described in the APA Addendum as "Cleared Areas" encompassing approximately 57 ac. During the visual inspection of the area, bomb fragments were observed throughout the entire area, along with .50 cal cartridge cases, links and projectiles, 2.25-inch rocket igniter leads and water/sand filled practice bomb debris. After analysis of the data it was determined that APA Area C may be an indication of a MRA. APA Area C was recommended as additional an MRA with 1500 foot radius from center of apparent target, and was designated as MRA-09. The area of the resultant MRA-09 is approximately 163 ac. The occurrence of this target on private property creates a substantial potential for public exposure to MEC originating from this target.

MRA-10 (APA Areas E, E1, and E2)

Area E was described in the APA Addendum as “Hill 2443 In Section 31 T12n, R10w” encompassing approximately 39 ac. During the visual inspection of the area, a large amount of bomb fragments and lighter fragments representative of a target were observed. Rock similar to that used to mark other MGRC targets, was observed on the hill and thought to have been used as a target marker. After analysis of the data it was determined that APA Areas E/E1/E2 may be an indication of a MRA. APA Areas E/E1/E2 were recommended as an additional MRA with 1500 foot radius from center of apparent target, and was designated as MRA-10. The area of the resultant MRA-10 is approximately 163 ac. The occurrence of this target on private property creates a substantial potential for public exposure to MEC originating from this target.

2.0 PROJECT ORGANIZATION, RESPONSIBILITIES, AND TRAINING

MARRS and their subcontractors, ERRG, Kleinfelder and Brown & Caldwell, will provide the qualified personnel required to perform all activities of the RI/FS. The overall organization of project personnel, responsibilities, and training is presented below and is addressed in greater detail in the MGRC RI/FS Work Plan, Chapters 2, 3, and 4. Refer to the MGRC RI/FS Work Plan Chapter 2 Figure 2-1 for the detailed project organization chart.

2.1 PROJECT ORGANIZATION AND STAFFING

The following personnel are responsible for the review, approval, and performance of the fieldwork identified in this SAP.

Title	Name
Project Manager	Chuck Welk
Project Chemist	Kirit Bhatt
UXOQC/SO	Mark Isabell
SUXOS	Armando Lucero

2.2 QUALIFICATIONS AND TRAINING OF PROJECT PERSONNEL

All field personnel assigned to the project will receive the appropriate guidance plans, including the SAP, in time for thorough review prior to commencing work in the field. The MARRS Project Manager has the ultimate responsibility for the qualification and training of MARRS project personnel, for the allocation of the resources necessary to provide training, for verifying that the adequacy of this training is periodically evaluated, and for verifying that refresher training is provided as appropriate.

MARRS maintains training files for MARRS project personnel at the Escondido, California office.

Training does and will include:

- Briefings on site-specific technical and quality issues and procedures as they relate to each worker's duties. Examples include project mission, objectives and quality requirements, sampling and shipping protocols, chain-of-custody (COC) requirements, project safety and biological/cultural resources issues, and management of IDW

- Current 40-hour Occupational Safety and Health Administration (OSHA) and 8-hour refresher for all workers, including respirator training, fit test, and medical doctor approval for respirator use
- On-the-job training for field personnel to review Standard Operating Procedures (SOPs)
- Field-team orientation and kick-off briefing to be held prior to initiation of field events
- Daily morning "tailgate" meetings to discuss site-specific health and safety and QA concerns related to specific daily work assignments

Each responsible manager will periodically review personnel training to verify that it is appropriate, adequate, and current. Personnel who have allowed their training to expire will not be allowed to work in exclusion zones at the MGRC until their training is updated.

Chemical analyses of soil samples will be performed by EMAX laboratories Inc. located in Torrance, California. At a minimum, the laboratory must be in compliance with the Department of Defense Quality Systems Manual for Environmental Laboratories (version 2 June 2002), which includes participation in the National Environmental Laboratory Accreditation Conference (NELAC) Standard Proficiency Testing Program and maintenance of applicable state-certifications regarding the normal environmental analytical suites of analyses as well as those associated with MC.

Columbia Analytical Services Inc. located in Kelso, Washington will be utilized as a QA laboratory in an effort to maintain quality throughout the analytical portion of this project. The QA laboratory will comply with the same requirements as discussed above.

Project analytical laboratories will provide training and maintain training files for all laboratory personnel. These files will be available for review by CESPL if requested.

A coy of the self-declarations for both EMAX Laboratories and Columbia Analytical Services are included in Appendix B of this SAP

3.0 DATA QUALITY OBJECTIVES

To generate data that will meet the project objectives, it is necessary to define the types of decisions that will be made, identify the intended use of the data, and design a data collection program that will meet the project objectives. The Data Quality Objectives (DQOs) include any type of information utilized to form a sampling strategy or achieve the objective, not just analytical data. The DQO process will assist in determining the appropriate sampling design, detection and quantitation limits, analytical methods, and sample handling procedures. The DQO process for this project was developed in accordance with the *Guidance on the Data Quality Objectives Process*, developed by the U.S. Environmental Protection Agency (EPA, 2000). The seven steps of the DQO process are presented below.

3.1 PROBLEM STATEMENT

Based on a review of the "Archives Search Report Findings for the Former Mojave Gunnery Range "C", Kern County, California, Project Number JO9CA728101, April 2002" and Draft Aerial Photo Analysis Site Visit Report, Former Mojave Gunnery Range "C" RI/FS, 19 March 2007, interviews of local personnel and businesses in and around the city of California City, and three site visits, MEC sites are known to be present within the MGRC. Therefore, there is a potential that MC contaminants may have impacted soil within these areas. This SAP has been prepared to evaluate the presence of MC constituents that may pose a threat to human health or the environment above acceptable levels at areas where visual or geophysical evidence indicate the presence of munitions.

3.1.1 Site Conceptual Model

The ASR indicates that a variety of MEC activities were performed in the former MGRC including "Dry run" and "Live Fire" exercises within each of the designated MRAs. The following list includes, but is not limited to MEC items of concern that have been identified as likely to be present on the former MGRC:

- Bomb, 3 to 4.5-lb Practice, Zinc Cast Iron, AN-MK5, MK23, with MK4 1-lb Signal
- Bomb, 20-lb Fragmentation, AN-MK41
- Bomb, 25-lb Practice, BDU-33/MK76, with MK4 1-lb Signal
- Bomb, 56-lb Practice, MK89, with MK4 1-lb Signal
- Bomb, 100-lb High Explosive, M30A1

- Bomb, 100-lb Practice, MK15 MOD3, with MK1 1-lb Spotting Charge
- Bomb, 100-lb Practice M38A2 Sand Filled with MK1 1-lb Spotting Charge
- Bomb, 250-lb High Explosive, M57A1
- Bomb, 500-lb High Explosive, AN-MK64A1
- Bomb, 500-lb Practice, MK5, MK15, MK21 without Spotting Charge
- Bomb, 1000-lb High Explosive, AN-MK65A1
- Bomb Unit, Practice, BLU061-A/B
- Bomb Unit, Practice, MK118 MOD0/MOD1
- Cartridges, 20-mm, TP
- Cartridges, 20-mm, HEI
- Landmine, Practice, VS-50
- Propelling Charge, M36A1
- Primer, M21A1
- Rocket, 2.75-Inch HE, FFAR
- Rocket, 2.25-Inch Practice, SCAR
- Rocket, 2.75-Inch Practice, FFAR
- Rocket, 5-Inch Practice, HVAR
- Small Arms Ammunition

There is no evidence that any type of chemical warfare material (CWM) was fired, used, stored, or handled at MGRC. Each of these MEC items poses a potential explosive hazard to the public and may have contained MC. Through visual and geophysical surveys, potential sampling locations will be identified within individual MRA. Once these locations are identified, visual observations within these areas will be evaluated to determine locations at which soil samples will be obtained to evaluate potential MC.

3.1.2 The Purpose of Study

The purpose of the SAP is to provide direction to collect and evaluate chemical data to make informed decisions that will determine; (1) if MC are present at MRAs (2) determine the concentrations of potential contamination at individual sample locations to determine the threat to public health or the environment, and (3) determine the need for additional delineation of MC within individual MRA sample locations, or if an effective and rapid initiation of the FS to develop the required remediation action for areas that pose a significant threat to public health or the environment from MC are required. Figure 1 illustrates the MRAs that are currently slated to be investigated within the MGRC RI/FS process. The actual locations of individual samples will be determined based on information gathered in the field. As both visual and geophysical field activities progress, areas of potential contamination may be discovered. The visual or geophysical evidence indicating potential contamination may include; soil staining, impacted vegetation, impact craters, areas of heavy munitions concentrations, or geophysical anomalies. As this information becomes available, Technical Memorandums (Tech Memos) will be generated itemizing the proposed sampling locations, analytes and the number of samples for individual sample areas. These Tech Memos will be submitted through CESPL to regulatory personnel for concurrence. Actual site visits by regulatory personnel may be performed if warranted. If it is determined that there is no current evidence that DoD activities have adversely impacted the individual MRAs with MC, then no sampling will be performed and no further action will be requested from the regulators.

The general approach for conducting the remedial investigation involves 1) visual reconnaissance; 2) geophysical surveys; 3) intrusive investigation of geophysical targets; and 4) soil sampling and fixed laboratory chemical analyses of soil samples for explosives and metals residues). Specific explosives and metals analytes to be analyzed for will be determined based on review of the USACE database identifying potential contaminants associated with specific munitions.

Based on historic information and previous site visits, it has been determined that there is essentially one geomorphic regime which is the desert terrace. Ambient metals analysis has been performed at locations typical of this geomorphic regime in areas not impacted by DoD activities to evaluate metals concentrations within these areas which constitute ambient levels. This work was performed by Soils Engineering, Inc (SEI, 2005) for the Proposed Elementary School Site during May of 2005. Potential metals analytical results will be compared to these ambient levels in an effort to evaluate potential risk to human health or the environment. This evaluation will include probability plots and statistical summaries as appropriate. Additionally, upcoming site data from the Edwards Air Force Base Target 71 project will be evaluated relative to data from the MGRC project.

Decision Statement:

Determine if sites within the MGRC contain MC at concentrations that exceed conservative screening levels and require additional investigation or can be recommended for No Further Action (NFA).

- Determine if any of the sampling locations within the individual MRAs have contamination of MC or metals commonly associated with these activities. This will be confirmed through chemical analysis utilizing EPA Test Methods SW-8330 and SW-6020 respectively.
- If detected, then determine if concentrations of MC or associated metals at individual sample locations exceed conservative human health and/or ecological soil screening levels as presented in Table 3-1.
- Based on comparison of the analytical test results, background test results (SEI) and the soil screening levels for potential impact to human health and/or ecological concerns, recommend additional investigation or NFA.

3.2 DECISION INPUTS

1. Historical information including ASR and aerial photographs, related to the potential location of target areas, and how these sites were used.
2. Personal interviews and stakeholder input from the Technical Project Planning Meetings
3. Results of initial site visits and additional formal visual reconnaissance (walking additional transects to enable detection of other evidence that have not been identified, i.e. craters, soil staining, differences in vegetation or other possible indicators of impact/target or firing sites) within individual MRAs.
4. Results of geophysical measurements in areas where visual indicators of MC are found
    a. Density of anomalies
    b. Results of excavations of a representative subset of anomalies indicating whether MEC, the depth and orientation of discovered objects and what type of munition was found.
    c. Fixed laboratory analysis for explosives residues (SW-846 8330)
    d. Fixed laboratory analysis for a subset of metals related to munitions for those samples where explosives constituents were detected using (SW-846 6020 or 6010B)

5. Human health and ecological risk-based soil screening thresholds for explosives residues and metals constituents of potential interest. Table 3-1 provides a list of metals and explosives constituents and associated soil-screening levels and fixed laboratory method performance information. Specific analytes may be selected based on the types of munitions encountered. Bolded values are proposed soil screening levels. If laboratory test results exceed the screening level thresholds a recommendation to perform a screening level ecological risk assessment (SLERA) will be made.

6. Evaluation of soil sample analytical laboratory test results relative to background metals concentrations study performed by SEI in 2005. Additionally, if soil data from the currently ongoing Edwards Air Force Base Target 71 project is available, it too will be evaluated.

3.3 DECISION BOUNDARIES

The geographical boundaries of the ten MRAs within MGRC are shown on the MGRC Site Map, Figure 1-1. Actual locations at which soil samples will be selected will be based on data obtained from visual and geophysical data. The actual process and actions involved in the visual and geophysical surveys are identified in Chapter 3 of the MGRC RI/FS Work Plan. For the purposes of this investigation, and consistent with the Military Munitions Center for Expertise March 2005 Technical Update, (MM CX, 2005) surface soil will be defined as the top 5 cm (2 in) of soil. Given the rate of movement of the surface materials due to the aeolian conditions subsurface contaminants will be evaluated as well. To address this concern, the study will also collect soil cores representing the 5- 30 cm (2 -12 in) layer within suspected MC sites within individual MRAs.

3.4 DECISION RULES

The overall decision logic for MEC sites is portrayed in Figure 3-1. The diagram details the activities related to determining whether MC is present in the soil at one or more locations within a MRA. Based on laboratory test results and comparison to the human health and ecological screening criterion, additional sampling may be recommended to determine appropriate remedial actions or, in the absence of contaminant concentrations in exceedances of the screening levels, determine that the MRA should be recommended for NFA for MC.

Table 3-1. Comparison of Fixed Laboratory Method Quantitation Limits to Human Health/Ecological Soil Screening Levels (bold numbers are proposed thresholds)

Analyte	Soil Screening Levels				Analytical Method EPA SW-846	Laboratory PQL (Soil, mg/kg)[b]
	HH (mg/kg) Residential[a]		Eco (mg/kg)			
Explosives						
RDX	**4.4**	Reg IX PRG	8	LANL[c] (Deer Mouse)	8330	0.4
TNT	16	Reg IX PRG	**8**	LANL[c] (Robin)	8330	0.4
HMX	3100	Reg IX PRG	**43**	LANL	8330	0.4
2-,4-DNT	120 noncarcinogen	Reg IX PRG	**1.3**	EPA Region 5[d] (Small Mammal)	8330	0.4
2,6-DNT	61 noncarcinogen	Reg IX PRG	**0.03**	EPA Region 5[d] (Small Mammal)	8330	0.4[e]
2-Am-DNT	12	Reg IX PRG	**5.3**[8]	LANL[c]	8330	0.4
4-Am-DNT	12	Reg IX PRG	**3.6**[8]	LANL[c]	8330	0.4
1,3,5-TNB	1800	Reg IX PRG	**0.38**[6]	EPA Region 5[d]	8330	0.35[e]
DNT Mixture	**0.72** carcinogen	Reg IX PRG	NA	N/A	8330	0.4
HMX	3,100	Reg IX PRG	**43**	LANL[c] (Deer Mouse)	8330	0.4
Nitrobenzene	**20**	Reg IX PRG	40	USEPA Region 4[f] (not specified)	8330	0.4
Tetryl	610	Region IX PRG	**2**	LANL[c] (Deer Mouse)	8330	0.4
3-Nitrotoluene	730	Reg IX PRG	**5.3**	LANL[c] (Mammal)	8330	0.4
2-Nitrotoluene	**0.88**	Reg IX PRG	4.1	LANL[c] (Mammal)	8330	0.4
4-Nitrotoluene	12	Reg IX PRG	**9.4**	LANL[c] (Mammal)	8330	0.4
Metals						
Aluminum	76000	Reg IX PRG	**11**	Eco-SSL[g] (Avian)	6020	0.2
Chromium	210	Reg IX PRG	**26**	EcoSSL[g] (Avian)	6020	0.01
Cobalt	900	Reg IX PRG	**120**	EcoSSL[g] (Avian)	6020	0.01
Copper	3,100	Reg IX PRG	**60**	ORNL[h] (invertebrates)	6020	0.15
Iron	2,3000	Reg IX PRG	NA	NA	6020	0.2
Lead	150	Reg IX PRG	**50**	ORNL[h] (plant)	6020	0.5
Manganese	1800	Reg IX PRG	**1**	ORNL[h] (plant)	6020	0.014
Magnesium	NA	NA	**0.3**	Eco SSL[g] (Mammal)	6020	0.11
Molybdenum	390	Reg IX PRG	NA	NA	6020	
Nickel	1600	Reg IX PRG	18	EcoSSL[g] (Plant)	6020	0.19
Nitrate	NA	NA	NA	NA	6020	
Potassium	NA	NA	NA	NA	6020	2
Sodium	NA	NA	NA	NA	6020	1
Tin	47000	Reg IX PRG	NA	NA	6020	
Titanium	100,000	Reg IX PRG	NA	NA	6020	
Vanadium	78	Reg IX PRG	13	EcoSSL[g] (Avian)	6020	0.01
Zinc	23,000	Reg IX PRG	**26**	EcoSSL[g] (Avian)	6020	0.06

[a] US Environmental Protection Agency, Region IX Residential Preliminary Remediation Goals, On-Line, http://www.epa.gov/region09/waste/sfund/prg/index.html

[b] USACE Contract Laboratory Practical Quantitation Limits (PQLs)

[c] *Los Alamos National Laboratory (LANL), 2004 (Sept.). ECO RISK Database (Release 2.1). LA-UR-7304. RRES-R package #186, ER ID 87386. Risk Reduction and Environmental Stewardship Remediation Service Program, Los Alamos National Laboratory, Los Alamos, NM.*

[d] US Environmental Protection Agency, Region V, Ecological Screening Levels, On-Line, http://www.epa.gov/region5/superfund/ecology/html/screeningbench.html

[e] PQLs for these analytes come close to meeting the soil screening levels, but are not quite sufficient. This should not represent a problem as the presence of these MC compounds being alone is very unlikely, as other of the above MC will also be present and these can be sufficiently detected.

[f] US Environmental Protection Agency Region IV, Recommended Ecological Screening Values, On-Line, http://www.epa.gov/region4/waste/ots/ecolbul.htm

[g] US Environmental Protection Agency, Ecological Soil Screening Levels (EcoSSLs), On-Line, http://www.epa.gov/ecotox/ecossl/

[h] Oak Ridge National Laboratory, Efroymson et al.., 1997

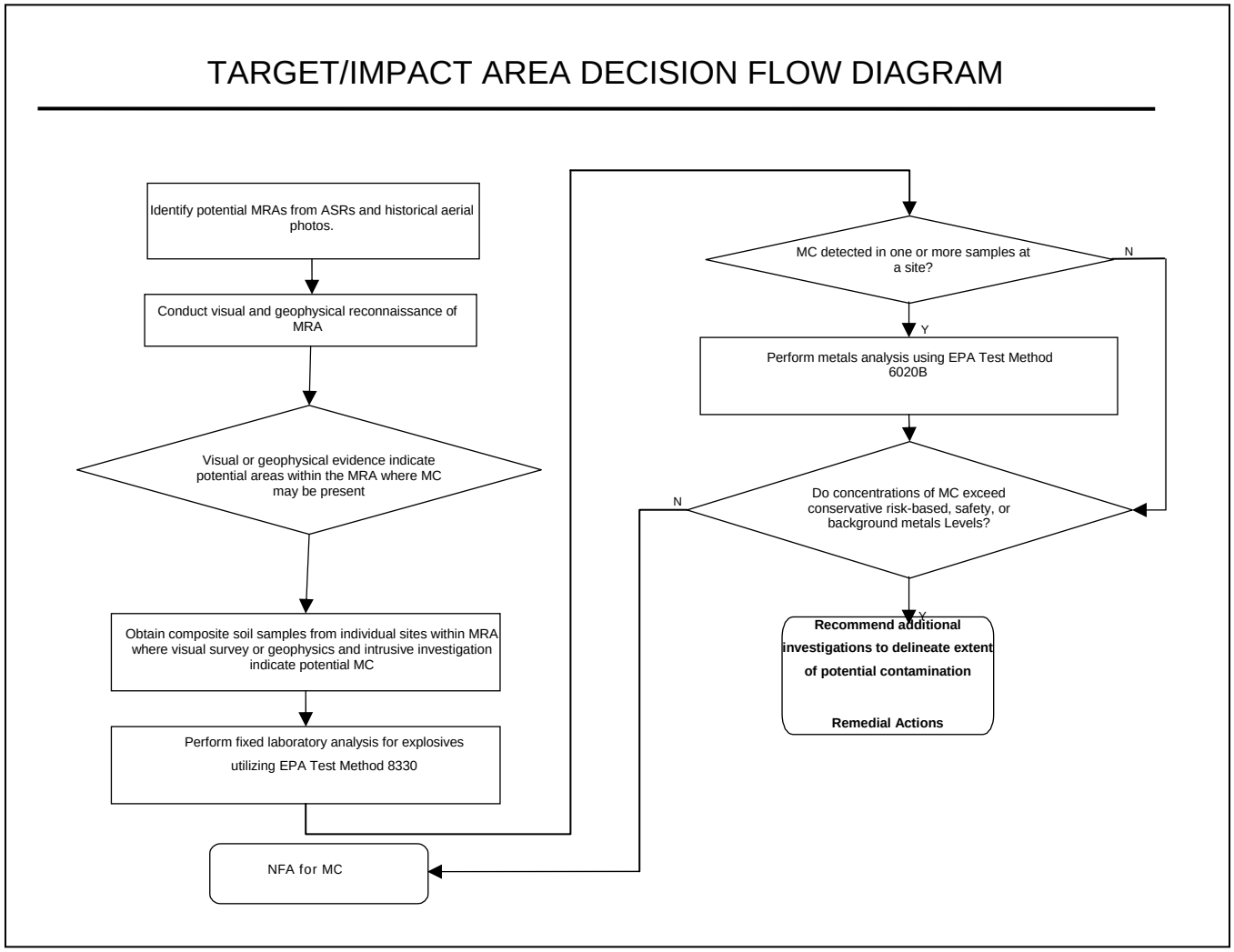

Figure 3-1. Decision Flow Chart

The specific adaptive decision rules for the locations are stated below.

- If visual or geophysical evidence (as indicated in Section 3.1.2) are indicative of one or more individual locations within a MRA, then these locations will be mapped and prioritized for soil sampling and analysis for MC in accordance with the specific munitions encountered.
- Soil samples will be analyzed for both explosives and metals in accordance with Table 3-1 which has been provided by the USACE. This information has been developed from the USACE database of explosives and metals associated with various ordnance.
- If concentrations of MC from surface or subsurface soil samples within a MRA exceed the proposed screening level thresholds and indicate a potential risk to human health or the environment based on conservative soil screening levels presented in Table 3-1, then the recommendation for additional investigations at those locations will be made, potentially including a SLERA and/or a human heath risk assessment (HHRA).
- If laboratory concentrations of MC in soil are less than soil screening levels established to be protective of both human health and the environment (Table 3-1) at all sampled locations in an MRA, then the MRA will be recommended for NFA.
- Concentrations of metals will be evaluated against analytical results for metals obtained during the SEI study, 2005 background metals study. If metals concentrations exceed soil screening levels and the background metals results, additional risk assessment will be recommended.

3.5 LIMITS ON UNCERTAINTY

Limits on the probability of making an incorrect decision are needed to assist in both the design to visually locate an individual sample location and the design to determine if MC is present within a potential sample location once it is identified.

3.5.1 Visual Identification Specifications

Within any MRA, observing visual evidence of a potential sampling location will be limited to the specified investigation transects. The physical specifications of the transect spacing to be maintained during the investigation of each MRA is detailed in Chapter 3 of the MGRC RI/FS Work Plan.

3.5.2 MC Identification Specifications

The basic specification for evaluating MC relates to the probability of identifying a sample location. The reason this problem is formulated as a detection problem is twofold. First, since the location of soil impacted by historical activities is unknown, a method is needed to provide confidence that an impacted area of a given size will be detected with a known probability. Second, that the maximum observed value from any one location will be used to compare results to conservative screening levels – not the mean concentration within a particular site. Therefore the goal is to provide good confidence that our sampling scheme will obtain soil from the smallest potentially affected area.

Once a potential sampling location has been identified within a MRA via visual and geophysical evidence, the field team will identify the location they believe represents the center of the site, and then sample within a 2 meter (6 ft) radius of this location.

3.6 OPTIMIZE THE DESIGN

Evaluation of the GIS information based on visual, geophysical, and intrusive data will be used to define actual sample locations. In some locations such as areas of dense concentrations of munitions which may require multiple sample points, the decision of the sample locations will be based solely on visual evidence which will meet the specifications stated above.

When and where visual and geophysical observations indicate potential MC (explosives and metals), soil samples will be collected to determine the presence of MC. Individual sample locations have not been identified for field sampling at this point, however, when potential areas are found, they will be subjected to the sampling protocol discussed below. To maximize the probability of detecting the presence of MC in soil and meet the stated specifications, a 7-sample wheel approach will be followed (US Army's Cold Regions Research and Engineering Laboratory (CRREL) 7 Sample Wheel Pattern as recommended by the Military Munitions Center of Expertise Technical Update (MM CX, 2005), and *Guide for Characterization of Sites Contaminated with Energetic Materials,* available at http://www.crrel.usace.army.mil/techpub/. The center of the wheel will be located at the assumed center of the sampling location. The diameter of the wheel will be 2 meters (6 ft) in diameter.

Given that MC typically exhibits a good deal of heterogeneity even on a small scale (Jenkins et al., 1997; Jenkins et al., 2001), each sample will be a composite of seven surface sub-samples from the top 5 cm (2 in) of soil. In addition to surface composites, three cores will be taken in a triangular pattern from each sample location, and one composite sample formed from the 5-30 cm (2-12 in) depth core soil material.

A 5 meter (18 ft) circle placed between sample stations would be detected at three locations by sub-samples taken at those locations.

When composite samples are used as a means of improving the probability of detecting a problem, or to lower the spatial variability in an estimate of a mean, there are some balancing considerations that must be considered to weigh the pros and cons of composite sampling. First, composites are typically not appropriate when volatile constituents are important, since the mixing and homogenization procedures will result in loss of the analytes of interest but this is not a concern here. Second, the analytical sensitivity should be adequate to account for the possibility that contaminants may be only present in as few as one of the sub samples. While possible, the second situation is generally of less concern for situations where the average concentration is of interest, and where composites are not taken over large spatial areas, such as in this case.

For the SAP, the goal is to maximize the probability of detecting MC, if it is present; and the pros of compositing far outweigh the cons in this regard.

As discussed above, the actual locations and number of samples will be developed after initial visual and geophysical surveys have been performed. As the decision rule indicates, if explosives or metals constituents (those associated with the encountered munitions) are detected within a MRA at concentrations above the screening levels, additional investigations or evaluations will be recommended.

4.0 NON-MEASUREMENT DATA ACQUISITION

The results of historical records searches, non-measurement data acquisition and data management are discussed in the MGRC RI/FS Work Plan (MARRS, 2007). An extensive records review and interview process for MGRC has been conducted by CESPL and its contractors to evaluate MEC risk at the site. This acquired data has been used to develop the proposed sampling design and the potential risk of soil contamination for the specific problems addressed by this FSP. As both visual and geophysical field activities progress, areas of potential contamination may be discovered. The visual or geophysical evidence indicating potential contamination may include; soil staining, impacted vegetation, impact craters, areas of heavy munitions concentrations, or geophysical anomalies. As this information becomes available, Tech Memos will be generated itemizing the proposed sampling locations, the number of samples for individual sample areas and the specific analytes to be evaluated based on the types of munitions encountered. These Tech Memos will be submitted through CESPL to regulatory personnel for concurrence. Actual site visits by regulatory personnel may be performed if warranted. If there are no visual or geophysical evidence of potential MEC, sampling points will not be identified and no sampling will be performed.

5.0 FIELD ACTIVITIES

All soil samples are planned to be obtained using disposable scoops or spoons to eliminate the requirement of decontamination which will result in reduced costs, investigation derived wastes and increased efficiency. Non-disposable equipment may be utilized during this investigation and will be subject to decontamination procedures discussed in Section 5.4.

Ten MRAs have been identified to be investigated under the MGRC RI/FS by review of the ASRs, aerial photographic analysis and physical site visits within the general area denoted in the ASR reports. As more information becomes available, additional sites may be discovered which may then be amended into the MGRC RI/FS Work Plan. Activities to be completed in accordance with the work plan will identify potential sampling points within the MRAs. If there are no visual or geophysical cues to indicate potential MEC or MC, no soil samples will be obtained. Concerns regarding cultural and natural resources are addressed in Chapter 7 of the MGRC RI/FS Work Plan (Natural and Cultural Resources Protection Measures).

Sampling procedures for the various sites will be in conformance with the Military Munitions Center of Expertise Technical Update, March 2005 "*Munitions Constituent (MC) Sampling*". Adjustments to the number and location of sample points may be made to accommodate the site conceptual model as additional information is developed. Site conceptual models are presented in Chapter 3 and Appendix I in the work plan. The sampling team will use appropriate personal protective equipment (PPE) as described in the Accident Prevention Plan (Appendix D of the MGRC RI/FS Work Plan). A UXO Escort will clear each sampling point prior to sampling and inspect all samples prior to shipment to ensure that soil samples are safe to ship. If the UXO Escort identifies visual evidence (i.e., presence of nodules, crusted or crystallized material, depressed vegetation, or noticeable staining) to indicate that there is an elevated level of explosives in the soil, the field team will make a notation in the field log and the sampling location will not be sampled. A near-by alternate location will be selected for sampling with the UXO escort approval so that the sample can be shipped to the laboratory.

5.1 DISCRETE/COMPOSITE SAMPLING REQUIREMENTS

Composite surface soil samples will be taken using a spoke and hub layout (radial perimeter method as discussed above), centered on the suspected center of each sample location (see Figure 5-1). A single surface composite sample 0-5 centimeters (0-2 inch), will be formed from each of seven discrete grabs: one from the coordinate location center and six from the radial perimeter sample locations (CEHNC-MM

CX, 2005). Every effort will be made to ensure that the portions used in the composite are approximately equivalent in weight; however these will not be individually weighted. In addition, three cores will be taken collocated to three of the radial perimeter locations (forming a triangle). The diameter of the composite sampling perimeter will be 2 meters (6 ft). Cores will be taken at three of the sub sample locations, starting at 5 centimeters (2 inches) and going down to 0.2 meters (1 ft), using disposable scoops or spoons, unless refusal occurs at a shallower depth. Once removed, soil from the three locations will be composited together to form a single composite subsurface sample. The first composite sample location will be placed in the location judged by the field team to be the center of the site. X-Y coordinates will be based on global positioning system (GPS) coordinates taken during the sampling events.

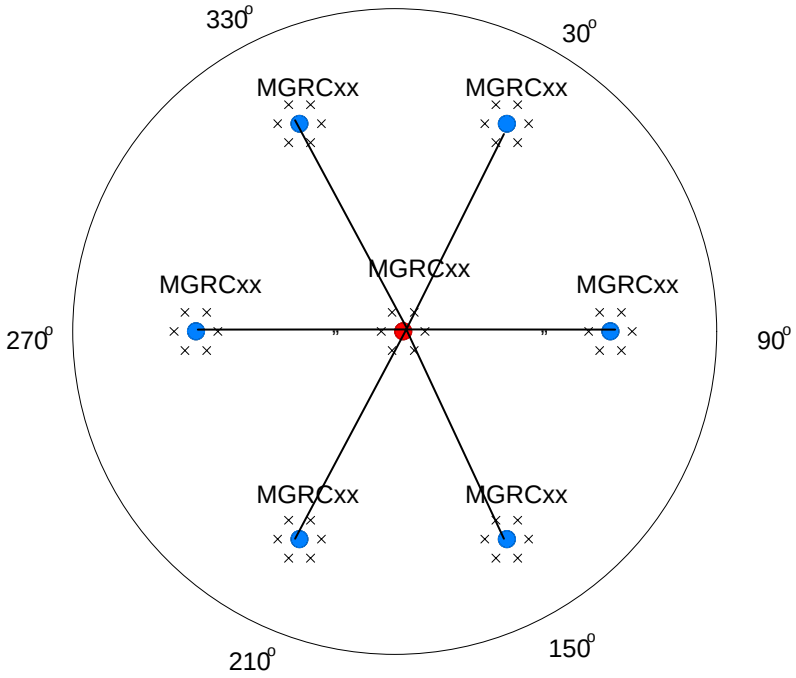

Figure 5-1. Establishing Triangular Grid Sampling Points by Using Center Point, a Compass, and Distance

5.1.1 SURFACE SAMPLES

The sampling protocol is discussed below.

1. Layout the intended sampling locations including the location of individual sub-samples[1] and record in the field log. Take two photographs. Prior to the collection of samples, the samplers will don clean nitrile gloves and will not allow the disposable sampling equipment to come in contact with potential sources of cross contamination.

2. At each location, a soil sample will be collected from the 0-5 centimeters (0-2 inch), depth interval using disposable scoops or spoons. Take care to collect equal volumes of sample at each of the locations for the 0-5 centimeters (0-2 inch), depth. Avoid stones and large pebbles. Vegetative material and plant root zone material will be screened out of the sample.

3. Transfer samples into a large enough zip lock bags to handle the material and allow for mixing.

4. Thoroughly mix the soil in the zip lock bag by manipulating the material by hand, and making sure to break all large particles into fine-grained material. The sample will be completely homogenized. Collect a sub sample of the composited material and place in a labeled glass jar.

5. Chemical preservation of the soil is not required. Temperature preservation is required. Specific containerization and preservation requirements are presented in the QAPP.

6. Fill out the sample label in accordance with the requirements in Section 6.4.2 and affix the label to the sample containers. Be sure to prepare the label carefully and clearly. Place all sealed sample containers in the sample cooler, on ice. Complete all COC documents and record in the field logbook.

7. If non-disposable equipment is used, decontaminate equipment after use and between sample locations (for non-disposable sampling equipment only) in accordance with Section 5.4.

5.1.2 CORE SAMPLES

Three core samples will be taken from each location and the material from these cores thoroughly composited prior to containerization.

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[1] A template (e.g., plastic sheet) can be used to quickly layout the location of the discrete grab samples that are portions of each composite.

1. Layout the intended sampling locations and record in the field log. Three alternating collocated locations will be used for cores, forming a triangular pattern, such that every other peripheral sampling location will be cored. Take two photographs. Prior to the collection of samples, the samplers will don clean nitrile gloves and will not allow the disposable sampling equipment to come in contact with a potential source of cross contamination.

2. At each of the sampling locations identified by the triangulation method discussed above, the core samples will be obtained by digging directly over the point that the surface grab samples were obtained to a depth of 5 cm (2 in). Disposable scoops or spoons will be utilized to obtain the samples. The core samples will be obtained from the bottom of the surface sample, (5 cm [2-inches]) down to 30 cm (12 inches) below the surface.

3. Transfer samples into a large enough zip lock bags to handle the material and allow for mixing.

4. Thoroughly mix the soil in the zip lock bag by manipulating the material by hand, and making sure to break all large particles into fine-grained material. The sample will be completely homogenized. Collect a sub sample of the composited material and place in a labeled glass jar.

4. Chemical preservation of the soil is not required. Temperature preservation is required. Specific containerization and preservation requirements are presented in the QAPP.

5. Fill out the sample label in accordance with the requirements in Section 6.4.2 and affix the label to the sample containers. Be sure to prepare the label carefully and clearly. Place all sealed sample containers in the sample cooler, on ice. Complete all COC documents and record in the field logbook.

6. If non-disposable equipment is required, decontaminate equipment after use and between sample locations (disposable sampling equipment is proposed) in accordance with Section 5.4.

5.1.3 BLOW-IN-PLACE (BIP) SAMPLES

Rationale/Design

Soil samples will be collected before and after any BIP actions. Both pre- and post-detonation samples shall be composite samples based on the CRREL 7-sample wheel approach (see Figure 5-1). Based on the size of the munitions requiring BIP actions, the diameter of the wheel may change and will be up to the discretion of the Senior UXO Supervisor (SUXOS) and sampling team.

BIP locations are generated by MEC items that are not safe to move and must be disposed of in place by detonation with donor explosive charges. Sampling of BIP locations will take place only after the SUXOS and UXO Quality Control/Safety Officer (UXOQC/SO), in coordination with the USACE UXO Safety Specialist have determined the area is safe to conduct the sampling activities.

5.2 SAMPLE LOCATIONS

By applying the basic design presented in Section 3.7, sampling coordinates will be developed for each of the sites to be sampled. The number and location of these sample points is undefined at this point and will be determined as discussed previously in Section 3.1.2.

A sampling template (e.g., plastic circle with seven holes cut out in the correct locations) will be provided for the 7 sub-sample aliquot wheel to assist the field sampling effort. By using the composite template at each of these locations, the exact locations to obtain sub-samples for each location can be quickly obtained. If required, judgmental samples will be determined in the field based on visual evidence.

5.3 QUALITY CONTROL SAMPLE COLLECTION

In order to monitor sampling performance and assess significant components within and between sampling unit variability, QC samples will be collected. QC samples will be obtained at the rate of 10% of the total from surface homogenized composites and core homogenized composites. Each field QC sample will be comprised of a field duplicate sub-sample taken from the bag used to homogenize the soil. The results of these QC duplicates will assist in determining the precision for the entire measurement system including sub-sample acquisition, homogeneity, handling, shipping, storage, preparation, and analysis. When compared with laboratory duplicates, a determination can be made as to the relative contribution of the sub-sampling and homogenization procedure performed in the field (based on the mean variance of the field QC samples), compared to the laboratory measurement process (based on the

mean variance of laboratory duplicates). The locations where QA samples will be chosen to represent multiple sites and multiple depths.

The following sampling methods apply:

1. Field QC samples (field duplicates) will be obtained from the thoroughly mixed and homogenized composite sample from the chosen location as described above. Enough samples will be obtained so that an additional sample container can be filled.

2. Transfer sample into an appropriate glass jars (refer to the QAPP Appendix A Table A1 for container requirements).

3. Secure the jars carefully. Specific containerization and preservation requirements are presented in Table A-1 of the QAPP.

4. Label the sample containers carefully and clearly. QC samples will be given a separate sample ID number. Place all sealed sample containers in the sample cooler, on ice. Complete all COC documents and record in the field logbook.

5. Decontaminate non-disposable equipment after use and between sample locations (disposable sampling equipment is proposed). For specific decontamination guidelines, consult Section 5.4.

Samples will be collected, labeled, packaged, and shipped in accordance with Section 7 of this FSP.

5.4 DECONTAMINATION PROCEDURES

Disposable sampling devices for this project are anticipated to consist of disposable scoops or spoons considered pre-cleaned providing they are in sealed containers and are not removed from the container until actual use. Disposable sampling devices do not require decontamination prior to use. Although disposable sampling equipment is preferred, non-disposable equipment may be used. If non-disposable equipment is used it shall be decontaminated as specified in section 5.4.1. Non-disposable equipment will be decontaminated after use and between sample locations. All re-usable sampling equipment that contacts potentially contaminated media must be cleaned prior to use of that device. Devices may include shovels, scoops, split spoons, hand augers, etc.